Studies on the terrestrial isopod crustaceans in Japan IV. Taxonomy of the families Trachelipidae and Porcellionidae

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Studies on the Terrestrial Isopod Crustaceans in Japan
IV. Taxonomy of the Families Trachelipidae and Porcellionidae*

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日本産陸棲等脚目甲殻類の研究
IV. トウヨウワラジムシ科およびワラジムシ科の分類

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第IV報では偽気管（白体）を持ち，第二触角の鞭部が2節からなるトウヨウワラジムシ科およびワラジムシ科について記載を行った。この2科はワラジムシ亜目中，系統上かなり高等なグループとされているが，同様に高等なグループとされるオカダンゴムシ科やコシビロダンゴムシ科とは体をまるめることの出来ない点で，容易に区別できる。今回扱った二つのグループのうち，トウヨウワラジムシ科は本州中央部以南各地の里山をはじめ，農耕地や市街地にもかなり普通にみられ，かつ比較的大型の種類を含むため，目につくことの多いグループである。ワラジムシ科は東北日本を中心として，市街地や農耕地さらには海岸林や海浜域にもかなり高密度で出現することが多く，一層大型の種類が多いためさらに人目を引くもので，実験材料や教材としても重要なグループである。

本報告では22新種を含む以下の32種を扱った。

トウヨウワラジムシ科（新称）　Trachelipidae STROUHAL, 1953
　ハヤシワラジムシ属（新称）　*Nagurus* HOLTHUIS, 1949
　　ヤマトハヤシワラジムシ（新称）　*Nagurus vannamei* (ARCANGELI, 1927)
　　カントウハヤシワラジムシ（新称）　*Nagurus kobarii* n. sp.
　　ニシカワハヤシワラジムシ（新称）　*Nagurus nishikawai* n. sp.
　　ナミベリハヤシワラジムシ（新称）　*Nagurus sinuosus* n. sp.
　　キシュウハヤシワラジムシ（新称）　*Nagurus minatoi* n. sp.
　　サンインハヤシワラジムシ（新称）　*Nagurus gigliotosi* (ARCANGELI, 1927)
　　サトヤマワラジムシ（新称）　*Nagurus nishimurai* n. sp.
　　ハチジョウハヤシワラジムシ（新称）　*Nagurus hachijoensis* n. sp.
　　アマミアナワラジムシ（新称）　*Nagurus tokunoshimaensis* n. sp.
　　サキモリハヤシワラジムシ（新称）　*Nagurus sakimori* n. sp.
　　フイリワラジムシ　*Nagurus maculatus* (IWAMOTO, 1943)
　　コガタハヤシワラジムシ（新称）　*Nagurus katakurai* n. sp.
　　ツシマワラジムシ（新称）　*Nagurus tsushimaensis* n. sp.

*Contributions from the Toyama Science Museum, No.65.

シラユキハヤシワラジムシ（新称） *Nagurus luridus* n. sp.
オガサワラハヤシワラジムシ（新称） *Nagurus boninsimensis* n. sp.
シロヒゲハヤシワラジムシ（新称） *Nagurus miyakoensis* n. sp.
タテスジハヤシワラジムシ（新称） *Nagurus lineatus* n. sp.
ハヤシワラジムシの一種 *Nagurus* sp.
サトワラジムシ属（新称） *Protracheoniscus* VERHOEFF, 1917
ヤマトサトワラジムシ（新称） *Protracheoniscus nipponicus* ARCANGELI, 1952
マサヒトサトワラジムシ（新称） *Protracheoniscus masahitoi* n. sp.
タンゴサトワラジムシ（新称） *Protracheoniscus tangoensis* n. sp.
サツマサトワラジムシ（新称） *Protracheoniscus satsumaensis* n. sp.
ホクリクサトワラジムシ（新称） *Protracheoniscus hokurikuensis* n. sp.
マダラサトワラジムシ（新称） *Protracheoniscus pannuosus* n. sp.
マルオサトワラジムシ（新称） *Protracheoniscus circacaudatus* n. sp.
アワサトワラジムシ（新称） *Protracheoniscus awaensis* n. sp.
ワラジムシ科 Porcellionidae VERHOEFF, 1918
チョビヒゲワラジムシ属（新称） *Leptotrichus* BUDDE-LUND, 1885
ヘリジロワラジムシ *Leptotrichus fuscatus* (IWAMOTO, 1943)
モンツキワラジムシ（新称） *Leptotrichus kudakaensis* n. sp.
ワラジムシ属 *Porcellio* LATREILLE, 1804
ワラジムシ *Porcellio scaber* LATREILLE,1804
クマワラジムシ（新称） *Porcellio laevis* (LATREILLE, 1804)
オビワラジムシ *Porcellio dilatatus* BRANDT, 1833
ホソワラジムシ属 *Porcellionides* MIERS, 1877
ホソワラジムシ *Porcellionides pruinosus* (BRANDT, 1833)

Family Trachelipidae STROUHAL, 1953

(Jap. name : Tôyô-warajimushi-ka, new)

Exopodites of pleopods 1-5 (or 1-3) with pseudotracheae. Second antenna with 2 flagellar segments, unable to conglobate. Two genera, *Nagurus* and *Protracheoniscus* are distributed in southern and central Japan.

Key to the genera of the Family Trachelipidae in Japan

1 Cephalon with a pair of well developed rectangular lateral lobes and well developed medial process. Posterolateral part of first peraeonal somite with sinuate or round .....Genus *Nagurus*

1' Cephalon with poorly developed lateral lobes. Posterolateral angles of first of first peraeonal somite round .....Genus *Protracheoniscus*

Genus *Nagurus* HOLTHUIS, 1949

(Jap. name : Hayashi-warajimushi-zoku, new)

This genus seems to have been treated in various senses by previous authors. The diagnosis given by SCHMALFUSS & FERRARA (1978) was adapted in this paper, with slight modification : Pleopod-exopodites 1-5 equipped with pseudotracheae ; antenna with 2-jointed flagellum ; head *Porcellio*-like, with prominent medial and lateral lobes ; epimera of peraeon segment 1 caudally concave ; telson as long as wide, sides distinctly concave, apex narrowly rounded ; tergite tuberculated. In Japanese species, there found some exceptions as to the epimera of first peraeonal somite ; they have a rounded margin instead of concave margin.

Key to Japanese species of the Genus *Nagurus*

1 First peraeonal somite with a concave margin 2
1' First peraeonal somite with a rounded margin 10
2 Second flagellar segment of second antenna more than twice as long as the first 3
2' Second flagellar segment of second antenna less than twice as long as the first 5
3 First peraeonal somite with a deeply concave caudal margin, exopodite of male first pleopod with concave distal margin ..... *N. sinuosus* n. sp.
3' First peraeonal somite with not so strongly concave caudal margin, exopodite of male first pleopod without concavity on distal margin 4
4 Body colour black with paler irregular patterns ..... *N. kobarii* n. sp.
4' Body colour white, pigmentless ..... *N. nishikawai* n. sp.
5 Body broad, length less than 1.8 times as long ..... *N. hachijoensis* n. sp.
5' Body not so broad, length more than twice as long 6
6 Pleotelson with a pair of distinct lateral concavities ..... *N. sakimori* n. sp.
6' Pleotelson without a distinct lateral concavity 7
7 Second antenna long, reaching the posterior end of second peraeonal somite, exopodite of male first pleopod with a small concavity on the basal part of outer margin ..... *N. nishimurai* n. sp.
7' Second antenna relatively short, reaching the anterior part peraeonal somite, exopodite of male first pleopod sometimes with a very shallow concavity 8
8 Eyes mediocre in size, each eye more than 14 ocelli 9
8' Eyes small, each eye composed only 6 ocelli ..... *N. tokunoshimaensis* n.sp.
9 Noduli lateralis II is remote ..... *N. gigliotosi* (ARCANGELI)
9' Noduli lateralis I is remote ..... *N. minatoi* n. sp.
10 Second flagellar segment of second antenna more than twice as long as the first 11
10' Second flagellar segment of second antenna nearly as long as the first segment ..... *N. lineatus* n. sp.
11 Exopodite of male first pleopod with a concavity on distal margin 12
11' Exopodite of male first pleopod without any concavity 16
12 Exopodite of male first pleopod with a very shallow but wide concavity

.....*N. katakurai* n. sp.
12' Exopodite of male first pleopod with a deep concavity on the distal margin 13
13 Body black 14
13' Body white 15
14 Noduli lateralis on peraeonal somites II-IV remarkably remote from the lateral margin .....*N. tsushimaensis* n. sp.
14' Noduli lateralis on peraeonal somites II-IV near the lateral margin .....*N. maculatus* (IWAMOTO)
15 Noduli lateralis of all the peraeonal somites near the lateral margin...*N. luridus* n. sp.
15' Noduli lateralis of peraeopods II-IV pretty remote from the lateral margin.....*N. boninshimensis* n. sp.
16 Exopodite of male first pleopod transverse.....*N. vannamei* (ARCANGELI)
16' Exopodite of male first pleopod rather sqaure.....*N. miyakoensis* n. sp.

Nagurus vannamei (ARCANGELI, 1927)

(Jap. name : Yamato-hayashi-warajimushi, new)

Fig. 101

Porcellio (Nagara) Van namei ARCANGELI, 1927.

Nagara vannamei VERHOEFF, 1931.

Nagara (Nagara) Van namei ARCANGELI, 1952.

Nagurus Van Namei ARCANGELI, 1962.

Material examined ; 1♂, near Kumamoto Air port, Kikuyô-machi, Kikuchi-gun, Kumamoto Pref., coll. Hiroshi Harada, Oct. 9, 1978 ; 1♂ 1♀, Takaoka-machi, Higashimorogata-gun, Miyazaki-Pref., coll. Hiroshi Harada ; 2♂♂ 1♀, Hachiman-dake, Ouchi-chô, Higashi-matsuura-gun, Saga Pref., coll. Shingo Tanaka ; 2♂♂ 3♀♀, the garden of the Imperial Palace, coll. Prince Masahito, Mar. 4, 1976.

Description : Body 2.1 times as long as wide. Body colour blackish with 2 rows and many paler irregular patterns. Body surface slightly granulated. Eyes mediocre in size, each eye composed of 16～20 ocelli. Cephalon with a well-developed medial process and rectangular lateral lobes. First peraeonal somite a little longer than the other somites. Noduli lateralis of the peraeonal somites I,Vand VII are remote from the lateral margin (Fig. 101 L).

First antenna ; first and second segments square ; terminal segment with 7～8 aesthetascs at the tip.

Second antenna (Fig. 101 B), reaching the second peraeonal somite, mutual length of second to fifth peduncular segments is 2 : 2 : 3 : 5. Flagellum is 85% length of the fifth peduncular segment ; second segment is 2.5 times as long as the first.

Right mandible (Fig. 101 C) ; pars incisiva 3-headed ; lacinia mobilis single-toothed ; 2 hairy bristles between lacinia mobilis and processus molaris.

Left mandible (Fig. 101 D); pars incisiva 4-headed; lacinia weakly 4-headed; 3 hairy bristles between lacinia mobilis and processus molaris.

First maxilla; (Fig. 101 E); outer lobe with 10 (4+6) teeth.

Second maxilla (Fig. 101 F) bilobed and unequal in size.

Maxilliped (Fig. 101 G); endite rectangular with 4 spines; palp narrow.

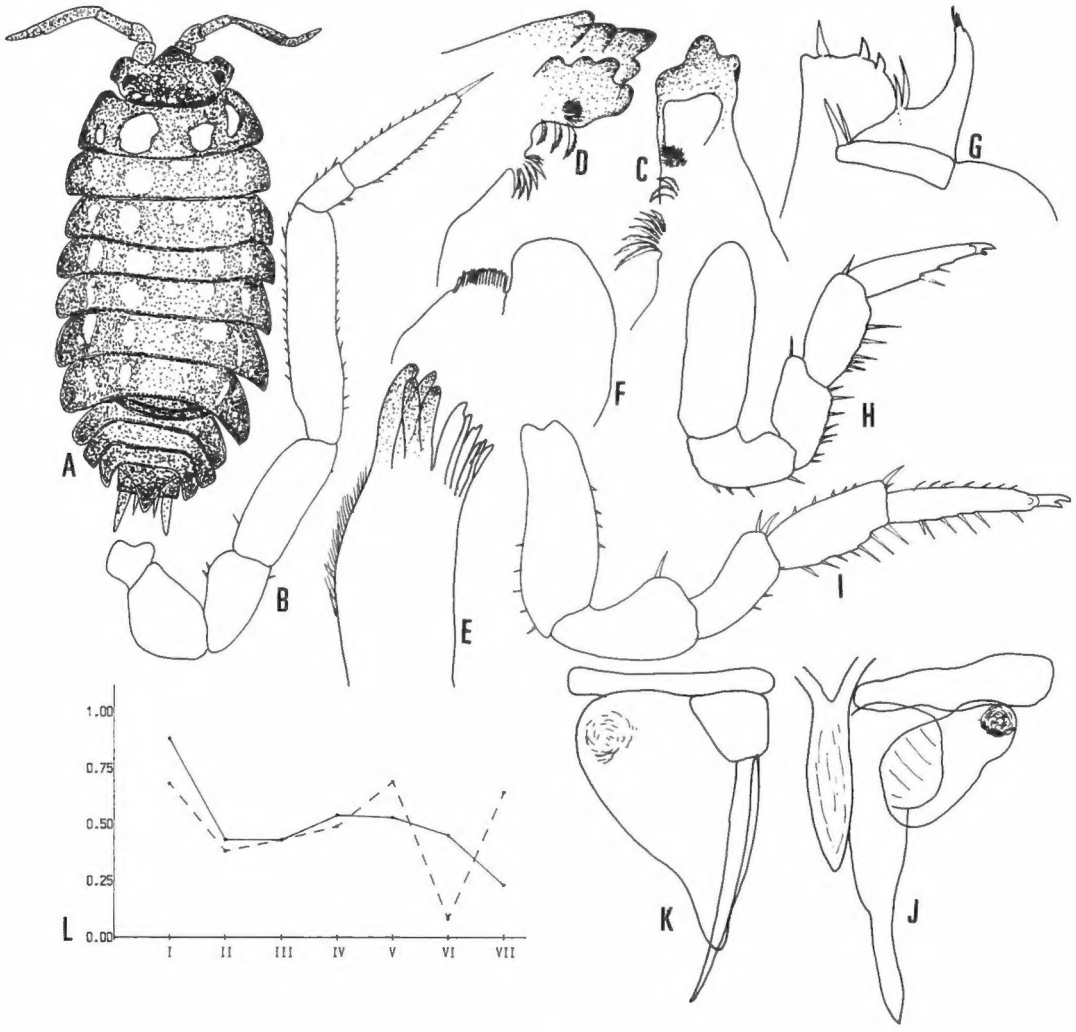

Fig. 101. *Nagurus vannamei* (ARCANGELI, 1927)

A. Dorsal view; B. Second antenna; C. Right mandible; D. Left mandible; E. Outer lobe of first maxilla; F. Second maxilla; G. Maxilliped; H. First peraeopod; I. Seventh peraeopod; J. Penes and male first pleopod; K. Male second pleopod; L. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All: Male specimens collected in Miyazaki Pref.).

First peraeopod (Fig. 101 H); basis oblong; ischium rectangular; merus rectangular with 8 setae on inner margin; carpus as long as merus with 6～7 setae on inner margin; propodus relatively short.

Seventh peraeopod (Fig. 101 I); basis oblong; ischium with a sternal margin bearing a seta; merus rectangular; carpus rectangular and slightly longer than merus; propodus long with 6～7 setae on inner margin.

Penes (Fig. 101 J) rather stout and fusiform.

Male first pleopod (Fig. 101 J); endopodite straight and rahter short; exopodite transversely rectangular, wider than long.

Male second pleopod (Fig. 101 K); endopodite long and almost straight; exopodite elongated triangular.

Uropod; basis stout; endopodite linear; exopodite stout, 1.5 times as long as endopodite.

Remarks: The specimens examined agree with the original description of this species, especially in the characteristic transverse exopodite of male first pleopod. Several features were newly described in this paper.

***Nagurus kobarii* n. sp.**

(Jap. name: Kantô-hayashi-warajimushi, new)

Fig. 102

Material examined: 1♂ (holotype, 7.3mm in body length) and 4♀♀ (1♀ allotype, 8.6mm in body length and 3♀♀ paratypes), Sakatsura-isozaki-jinja, Isozaki-machi, Nakaminato City, Ibaragi Pref., coll. Hiroshi Kobari, Aug. 6. 1981; 1♂, Ogawa-machi, Higashiibaragi-gun, Ibaragi Pref., coll. Hisao Inoue, Aug. 4, 1982; 1♀, Batô-chô, Nasu-gun, Tochigi Pref., coll. Hisao Inoue, Aug. 6, 1982; 1♂ 4♀♀, Mogi-chô, Nasu-gun, Tochigi Pref., coll. Hisao Inoue, Aug, 26, 1981; 2♀♀, Takenouchi, Iwaki City, Fukushima Pref., coll. Osamu Nakamura, Sep. 28, 1983. Type series is deposited as follows: holotype (TOYA-Cr-6530), allotype (TOYA-Cr-6531) at the Toyama Science Museum, a paratype (OMNH-Ar-3072) at the Osaka Museum of Natural History, a paratype (YCM-CI-925) at the Yokosuka City Museum and a paratype (NSMT-Cr-9338) at the National Science Museum, Tokyo.

Description: Body oval-lanceolate, 2.0 times as long as wide. Body colour blackish-brown with paler irregular patterns and lateral patterns. Body surface smooth. Cephalon with triangular medial process and rectangular lateral lobes. Eyes mediocre in size, each eye composed of about 15 ocelli. Posterolateral angles of the first peraeonal somite concave. Pleotelson triangular, sides slightly concave; its tip rounded. Noduli lateralis on peraeonal somites II-IV are remote from the lateral margin (Fig. 102 N).

First antenna (Fig. 102 B); first segment big; second segment rather short; terminal segment with 4 aesthetascs at the tip.

Second antenna (Fig. 102 C), reaching the second peraeonal somite, mutual length of the second to fifth peduncular segments is 2 : 2 : 3 : 5. Flagellum 3/4 as long as the fifth pedun-

cular segment ; terminal flagellar segment twice as long as the basal segment.

Right mandible (Fig. 102 D) ; pars incisiva 3-headed ; lacinia mobilis single-toothed ; 4 hairy bristles between lacinia mobilis and processus molaris.

Left mandible (Fig. 102 E) ; pars incisiva 3-headed ; lacinia mobilis single-toothed ; 3

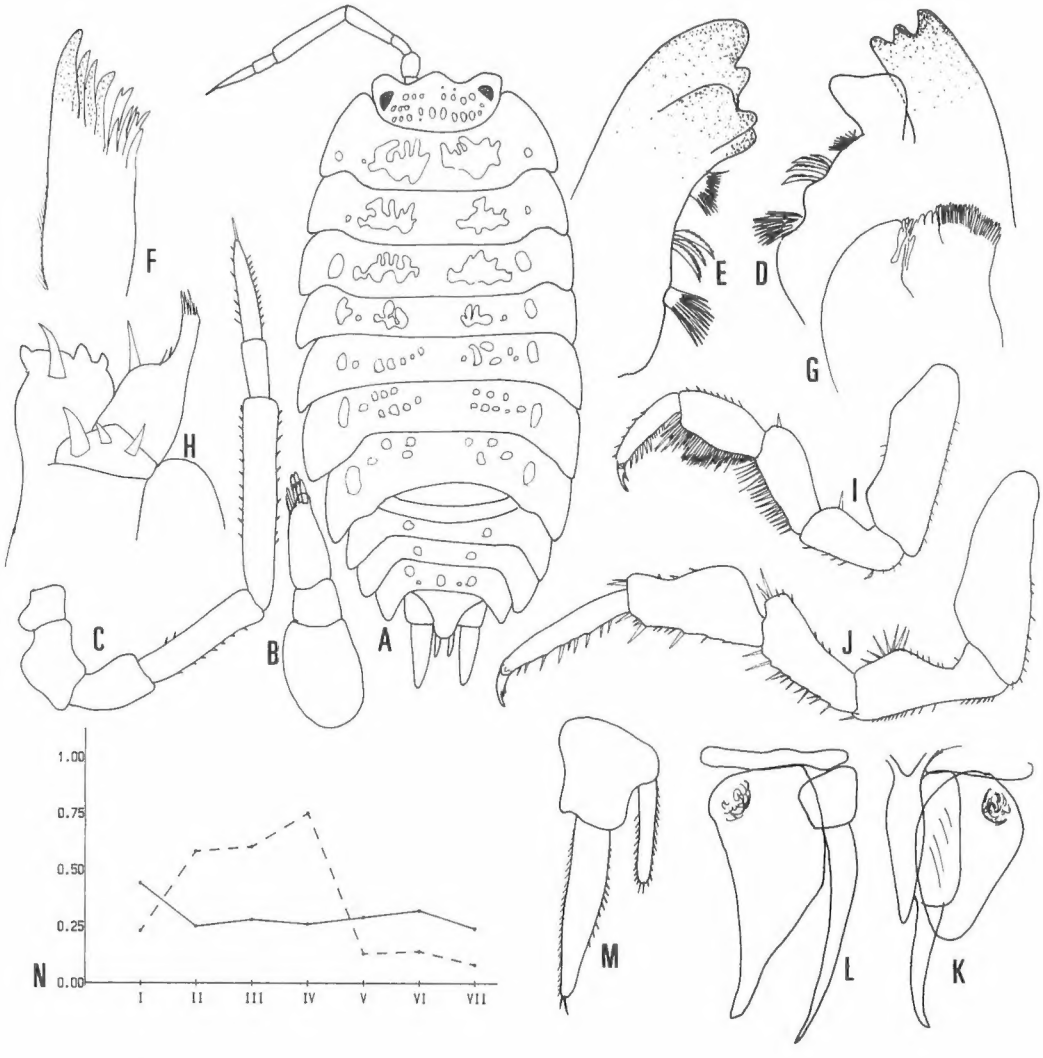

Fig. 102. *Nagurus kobarii* n. sp.

A. Dorsal view ; B. First antenna ; C. Second antenna ; D. Right mandible ; E. Left mandible ; F. Outer lobe of first maxilla ; G. Second maxilla ; H. Maxilliped ; I. First peraeopod ; J. Seventh peraeopod ; K. Penes and male first pleopod ; L. Male second pleopod ; M. Uropod ; N. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All : Holotype male).

hairy bristles between lacinia mobilis and processus molaris.

First maxilla (Fig. 102 F); outer lobe with 10 (4+6) teeth, two of them bifid.

Second maxilla (Fig. 102 G); bilobed, dental part wide.

Maxilliped (Fig. 102 H); endite with 3 spines and a strong tooth; palp relatively stout, basal segment with 3 strong setae.

First peraeopod (Fig. 102 I); basis oblong; ischium rectangular; merus and carpus rectangular with many setae on inner margin densely; propodus relatively short.

Seventh peraeopod (Fig. 102 J); basis rectangulr; ischium with a sternal margin; merus triangular with 10 setae on inner margin; carpus rectangular but with a swollen part on basal margin; propodus long with 10 teeth on inner margin.

Penes (Fig. 102 K); fusiform.

Male first pleopod (Fig. 102 K); endopodite straight, apical part bent outwards slightly; exopodite ovate, without any concavity.

Male second pleopod (Fig. 102 L); endopodite straight; exopodite long and as equally extends beyond endopodite, with 4 denticles on outer margin.

Uropod (Fig. 102 M); basis square; endopodite narrow; exopodite nearly twice as long as endopodite.

Remarks: The present new species is allied to *Nagurus vannamei* (ARCANGELI), but being separated from the latter in the following features: (1) longer exopodite of male first pleopod, (2) rather longer flagellar segment, (3) swollen carpus of male seventh peraeopod, and (4) noduli lateralis of peraeonal somites II to III are remote from the lateral margin.

Nagurus nishikawai n. sp.

(Jap. neme: Nishikawa-hayashi-warajimushi, new)

Fig. 103

Material examined: 1♂ (holotype, 5.3mm in body length) and 3♀♀ (1♀ allotype, 6.7mm in body length and 2♀♀ paratypes, 3.0～5.6mm in body length), Makuragiyama, Matsue-City, Shimane Pref., coll. Yosahiaki Nishikawa, Sep. 4, 1984; 4♀♀, between Utsu and Nagaonohana, Hagi City, Yamaguchi Pref., coll. Yoshiaki Nishikawa, May 6, 1978; 2♀♀, Daisen-nishihodô, Daisen-machi, Seihaku-gun, Tottori Pref., Sep. 7, 1984. Type series is deposited as follows: holotype (TOYA-Cr-6695), allotype (TOYA-Cr-6696) at the Toyama Science Museum, a paratype (OMNH-Ar-3083) at the Osaka Museum of Natural History, and a paratype (NSMT-Cr-9342) at the National Science Museum, Tokyo.

Description: Body, 2.4 times as long as wide. Body pure-white in the specimens from type locality. Body surface only minutely granulated. Cephalon with a low triangular medial process and a pair of short rectangular lateral projections. Eyes rather small, each eye with about 16 ocelli. Each peraeonal somite subequal in length. Noduli lateralis is as Fig. 103 L. Pleonal somites I-II narrow. Pleonal somites III-V with distinct epimera. Pleotelson triangular.

First antenna (Fig. 103 B) ; first segment cylindrical ; second segment square ; terminal segment rectangular with 4 relatively short aesthetascs at the tip.

Second antenna (Fig. 103 C) ; flagellum a little shorter than the fifth peduncular segment ; second segment 2.6 times as long as the first.

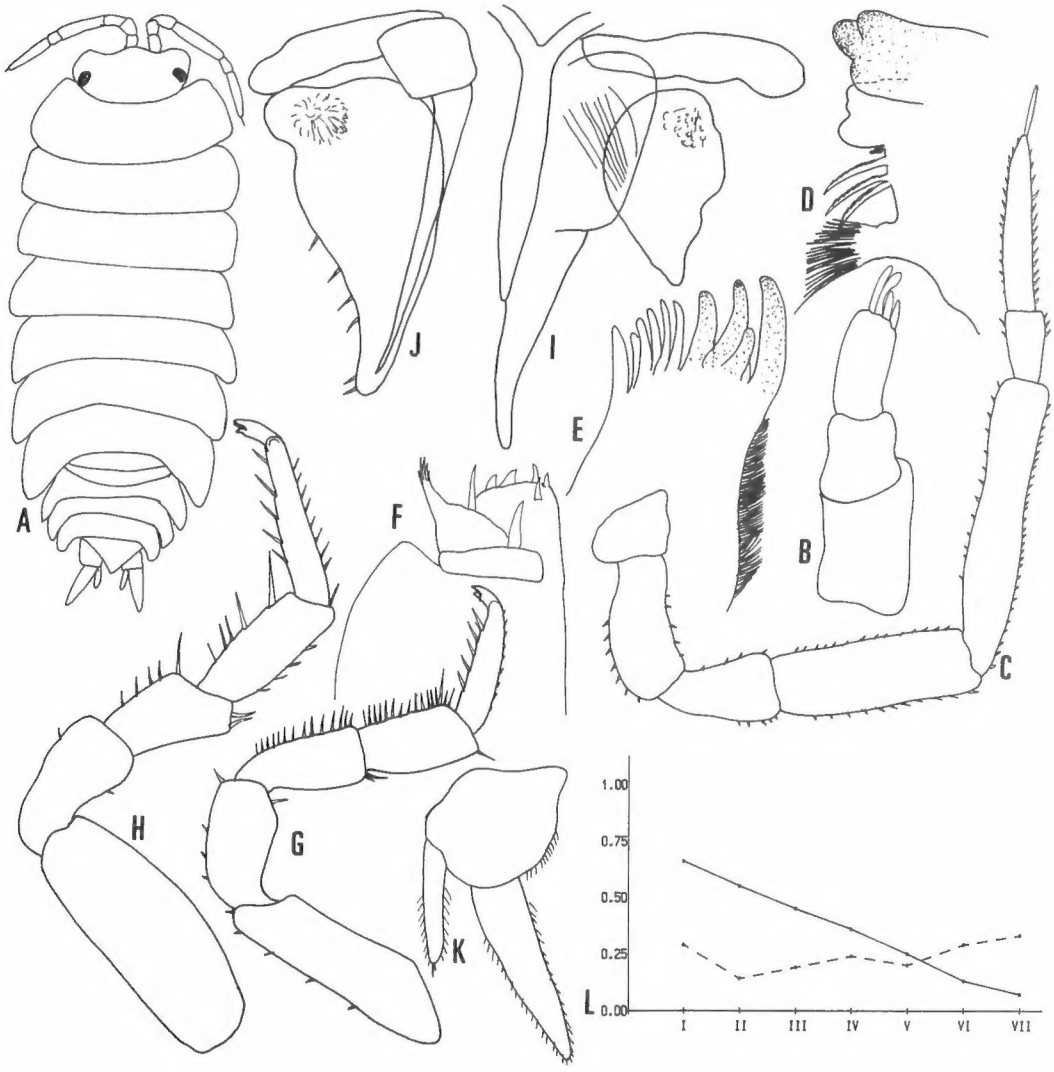

Fig. 103. *Nagurus nishikawai* n. sp.

A Dorsal view ; B. First antenna ; C. Second antenna ; D. Right mandible ; E. Outer lobe of first maxilla ; F. Maxilliped ; G. First peraeopod ; H. Seventh peraeopod ; I. Penes and male first pleopod ; J. Male second pleopod ; K. Uropod ; L. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All : Holotype male).

Right mandible (Fig. 103 D) ; pars incisiva 3-headed ; lacinia mobilis weakly 2-headed ; 3 hairy bristles between lacinia mobilis and processus molaris.

Left mandible ; pars incisiva 4-headed ; lacinia mobilis 3-headed ; 2 hairy bristles between lacinia mobilis and processus molaris.

First maxilla (Fig. 103 E) ; outer lobe with 10 entire (4+6) teeth at the tip.

Second maxilla bilobed and wide.

Maxilliped (Fig. 103 F) ; endite with 2 spines and a seta ; palp with a strong tooth on the middle part.

First peraeopod (Fig. 103 G) ; basis oblong ; ischium rectangular ; merus rectangular with a series of setae on inner margin ; carpus also rectangular ; propodus relatively short.

Seventh peraeopod (Fig. 103 H) ; basis oblong with a dozen of minute setae on inner margin ; ischium spreads towards the distal end and with a low sternal margin on outer margin ; merus as long as ischium, with 3 longer and 8～10 shorter setae on inner margin ; carpus slightly longer than merus, with 5～6 stronger and 6～8 weaker setae on inner margin ; propodus relatively short, with 5 setae on inner margin.

Penes (Fig. 103 I) slender and fusiform.

Male first pleopod (Fig. 103 I) ; endopodite straight and rather short ; exopodite semicircular with a small concavity on outer margin and with a rather acute tip.

Male second pleopod (Fig. 103 J) ; endopodite straight and rather short ; exopodite elongated triangular with 6 spines on outer margin.

Uropod (Fig. 103 K) ; basis almost square ; endopodite narrow with many setae around the margin ; exopodite rather stout.

Remarks : The present new species is most closely allied to *Nagurus kobarii* just described in this paper, but the former is separable from the latter in the following features : (1) white body colour, (2) rounded posterolateral margin of peraeonal somite, (3) lack of swollen process on carpus of male seventh peraeopod, and (4) noduli lateralis on all the peraeonal somites near the lateral margin. The body coloration is pure white in the specimens from the type locality, Matsue, but slightly brownish in the specimens from neighbouring localities, Tottori and Yamaguchi.

Nagurus sinuosus n. sp.

(Jap. name : Namiberi-hayashi-warajimushi, new)

Fig. 104

Material examined ; 5♂♂ (1♂ holotype, 5.8mm in body length and 4♂♂ paratypes) and 6♀♀ (1♀ allotype, 10.5mm in body length and 5♀♀ paratypes), Mitsutsuji-yama, Tosa-chô, Tosa-gun, Kochi Pref., coll. Yoshiaki Nishikawa, July 26, 1976. Type series is deposited as follows : holotype (TOYA-Cr-6549), allotype (TOYA-Cr-6550) and 3 paratypes (TOYA-Cr-6551～6553) at the Toyama Science Museum, 2 paratypes (OMNH-Ar-3073～3074) at the Osaka Museum of Natural History, 2 paratypes (YCM-CI-926～927) at the Yokosuka City

Museum and 2 paratypes (NSMT-Cr-9339) at the National Science Museum, Tokyo.

Description : Body oval-lanceolate, 2.2 times as long as wide. Body colour brown with a pair of longitudinal paler patterns and many paler irregular patterns. Body surface smooth. Cephalon with a low triangular medial process and well developed lateral lobes. Eyes mediocre in size, each eye composed of about 15 ocelli. First peraeonal somite longer than other peraeonal somites. Posterolateral margins of peraeonal somites I-III with a pair of very remarkable concavities. Pleotelson triangular, sides slightly concave. Noduli lateralis on the peraeonal somite IV is very remote from the lateral margin (Fig. 104 N).

First antenna (Fig. 104 B) ; first and second segments square ; third segment with 5 aesthetascs at the tip.

Second antenna (Fig. 104 C), reaching the anterior part of the second peraeonal somites. Flagellum somewhat shorter than the fifth peduncular segment ; second segment about twice as long as the first.

Right mandible (Fig. 104 D) ; pars incisiva 3-headed ; lacinia mobilis single-toothed ; 3 hairy bristles between lacinia mobilis and processus molaris.

Left mandible (Fig. 104 E) ; pars incisiva 3-headed ; lacinia mobilis 3-headed ; 4 hairy bristles between lacinia mobilis and processus molaris.

First maxilla (Fig. 104 F) ; outer lobe with teeth at the tip.

Second maxilla (Fig. 104 G) bilobed.

Maxilliped (Fig. 104 H) ; endite with 2 strong teeth ; palp relatively slender.

First to third peraeopods (Fig. 104 I) ; basis oblong ; ischium rectangular ; merus and carpus with densely arranged setae on inner margin. Fourth peraeopod with dense setae only on the inner margin of carpus.

Seventh peraeopod (Fig. 104 J) ; basis oblong ; ishcium with a low sternal margin which bears 3 long setae ; merus rectangular with about 10 setae on inner margin ; carpus somewhat longer than merus and with 12～13 stouter setae on inner margin ; propodus relatively short with 10～11 setae on inner margin.

Penes (Fig. 104 K) linear and its tip is truncate.

Male first pleopod (Fig. 104 K) ; endopodite straight and its tip bent outwards ; exopodite longer than wide with a shallow concavity and a small denticle on distal margin.

Male second pleopod (Fig. 104 L) ; endopodite slender ; exopodite, as long as the endopodite, deltoid with 11 spines on outer margin.

Uropod (Fig. 104 M) ; basis square ; endopodite narrow with a tuft of long setae at the tip ; exopodite stout and 1.3 times as long as endopodite.

Remarks : The present new species is most closely allied to *Nagurus kobarii* already described in this paper, but the former is separated from the latter in the following features ; (1) very sinuate posterior margins of first to fourth peraeonal somites, (2) well developed lateral lobe of cephalon, (3) extremely remote position of noduli lateralis on peraeopod IV, (5) truncated tip of penes, and (6) lack of swollen part on carpus of male seventh peraeopod.

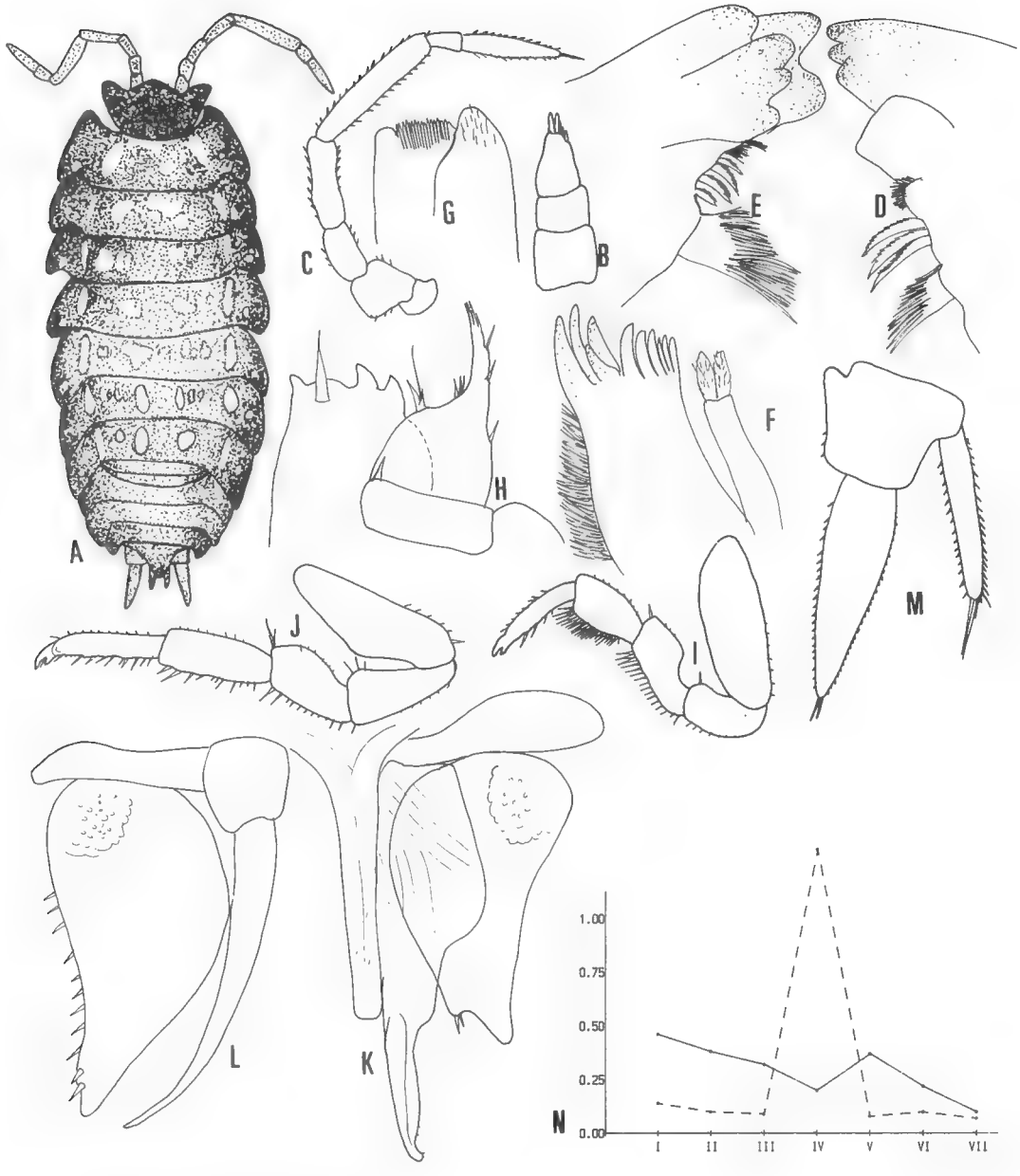

Fig. 104. *Nagurus sinuosus* n. sp.

A. Dorsal view ; B. First antenna ; C. Second antenna ; D. Right mandible ; E. Left mandible ; F. First maxilla ; G. Second maxilla ; H. Maxilliped ; I. First peraeopod ; J. Seventh peraeopod ; K. Penes and male first pleopod ; L. Male second pleopod ; M. Uropod ; N. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All : Holotype male).

Nagurus minatoi n. sp.

(Jap. name : Kishû-hayashi-warajimushi, new)

Fig. 105

Material examined : 1♂ (holotype, 6.0mm in body length) and 1♀ (allotype, 7.4mm in body length), from a cave called "Kobiki-shitano-ana", Shirasaki-Kobiki, Yura-chô, Hidaka-gun, Wakayama Pref., coll. Hiroshi Minato, May 18, 1986. Holotype (TOYA-Cr-6541) and allotype (TOYA-Cr-6542) are deposited at the Toyama Science Museum.

Description : Body oblong, 2.3 times as long as wide. Body colour brown with many paler irregular patterns. Body surface slightly granulated. Cephalon with a low triangular medial process prominent and rectangular lateral lobes. Eyes small, each eye composed of 14～15 ocelli. Each peraeonal somite subequal in length. Posterolateral corner of the first peraenal somite slightly protruded. Neopleuron slightly protruded. Pleotelson triangular, sides only slightly concave. Noduli lateralis on peraeonal somites III and IV are remote (Fig. 105 L).

First antenna (Fig. 105 B) ; first segment square ; second segment almost square ; terminal segment rectangular with 8 aesthetascs at the tip.

Second antenna (Fig. 105 C), reaching the posterior part of the second peraeonal somites ; first to third segments square ; fourth segment 2.3 times as long as the third ; fifth segment 1.5 times as long as the fourth. Terminal flagellar segment 3 time as long as the basal one.

Right manible (Fig. 105 D) ; pars incisiva weakly 4-headed ; lacinia mobilis single-toothed ; 4 hairy bristles between lacinia mobilis and processus molaris.

Left mandible (Fig. 105 E) ; pars incisiva 3-headed ; lacinia mobilis 2-headed ; 3 hairy bristles between lacinia mobilis and processus molaris.

First maxilla (Fig. 105 F) ; outer lobe with 10 (4+6) teeth at the tip.

Second maxilla (Fig. 105 G) ; bilobed and rather wide.

Maxilliped (Fig. 105 H) ; endite broad with 4 spines and a strong tooth ; palp relatively wide, first segment 2 strong teeth.

First peraeopod ; basis oblong ; ischium short with a low sternal margin bearing a strong setae ; merus rectangular with many setae on inner margin ; carpus rectangular and as long as merus, bears many setae on inner margin densely ; propodus short with 3 setae and many small denticles on inner margin.

Seventh peraeopod (Fig. 105 I) ; basis robust with a seta at the inner distal corner ; ischium rectangular with many setae on inner margin and 7～8 setae at the outer sternal margin ; merus and carpus rectangular ; propodus long.

Penes (Fig. 105 J) fusiform.

Male first pleopod ; endopodite straight and rather short, bearing 5～6 denticles near the part ; exopodite rectangular with a very shallow concavity and a small seta on the distal margin.

Male second pleopod (Fig. 105 K) ; endopodite relatively short and straight ; exopodite

elongated without any concavity and bears 10 denticles on outer margin.

Uropod ; basis rectangular ; endopodite narrow ; exopodite stout.

Remarks : The present new species is closely allied to *Nagurus vannamei*, but the former is separated form the latter in the following features : (1) long exopodite of male first pleopod, (2) narrowered exopodite of male second pleopod, and (3) extremely remote noduli lateralis on peraeonal somites III-IV.

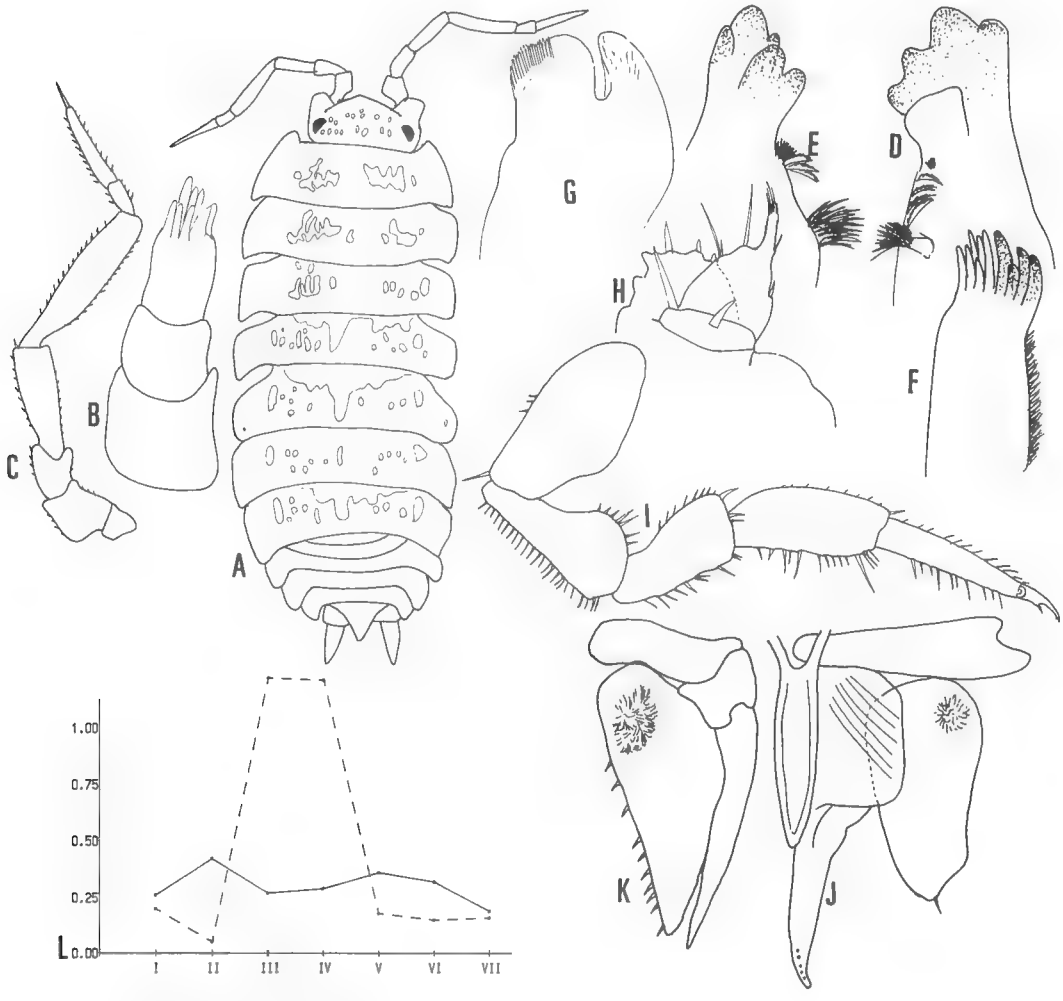

Fig. 105. *Nagurus minatoi* n. sp.

A. Dorsal view ; B. First antenna ; C. Second antenna ; D. Right mandible ; E. Left mandible ; F. Outer lobe first maxilla ; G. Second maxilla ; H. Maxilliped ; I. Seventh peraeopod ; J. Penes and male first pleopod ; K. Male second pleopod ; L. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All : Holotype male).

Nagurus gigliotosi (ARCANGELI, 1927)

(Jap. name : San'in-hayashi-warajimushi, new)

Fig. 106

Porcellio (Lucasioides) Giglio-Tosi ARCANGELI, 1927

Lucasius (?) gigliotosi ARCANGELI, 1931

Protracheoniscus (Lucasioides) Giglio-tosi ARCANGELI, 1952

Material examined : 6♂♂ 2♀♀, Yanai, Ooda City, Shimane Pref., coll. Noboru Nunomura, Nov. 3, 1982 ; 2♂♂ 5♀♀, Nima, Maji-chô, Shimane Pref., coll. Noboru Nunomura, Nov. 3, 1982 ; 2♂♂ 6♀♀, Kamo, Saigô-chô, Oki-gun, Oki Island, Shimane Pref., coll. Noboru Nunomura, Sep. 17, 1976.

Description : Body 2.1 times as long as wide. Body size reaches 10.4 mm in length. Body colour brown with paler paterns. Body surface smooth. Cephalon with medial process and well developed lateral lobes. Eyes mediocre in size, each eye composed of about 15 ocelli. Peraeonal somite I-III with remarkably sinuated posterolateral margin. Pleotelson triangular without any concavity. Noduli lateralis on the peranonal somites II-IV relatively remote (Fig. 106 M).

First antenna (Fig. 106 B) ; first segment rectangular ; second segment short ; terminal segment rectangular with 4 aesthetascs at the tip.

Second antenna (Fig. 106 C), reaching the posterior margin of the second peraeonal somite, mutual length of second to fifth peduncular segment is 1 : 2 : 3 : 4. Flagellum slightly shorter than the fifth peduncular segment ; first flagellar segment 70% as long as the second.

Right mandible (Fig. 106 D) ; pars incisiva 3-headed ; lacinia mobilis 3-headed ; 3 hairy bristles between lacinia mobilis and processus molaris.

Left mandible (Fig. 106 E) ; pars incisiva 3-headed ; lacinia mobilis 4-headed ; 2 hairy bristles between lacinia mobilis and lacinia mobilis.

First maxilla (Fig. 106 F) ; outer lobe with 10 (4+6) teeth.

Second maxilla bilobed.

Maxilliped (Fig. 106 G) ; endite rectangular with 4 stout spines ; palp rather stout.

First peraeopod (Fig. 106 H) ; basis rectangular ; ischium about half length of basis ; merus and carpus with many setae on inner margin ; propodus rather short.

Seventh peraeopod (Fig. 106 I) ; basis and ischium oblong ; merus and carpus rectangular with 6～7 setae on inner margin ; propodus rather long.

Penes (Fig. 106 J) ; narrow lanceolate.

Male first pleopod (Fig. 106 J) ; endopodite straight with a series of small denticles ; exopodite rectangular and straight with a very shallow concavity at the tip.

Male second pleopod (Fig. 106 K) ; endopodite relatively short, not extendinig beyond the exopodite ; exopodite elongated with 10 spines on outer margin.

Uropod (Fig. 106 L) ; basis almost square ; endopodite narrow ; exopodite rather long, 1.5 times as long as basis.

Remarks : The specimens at my disposal rather well fit with the original description ; but as to the shape of exopodite of male first pleopod, some differences are observed, namely, some specimens collected at Ooda City are provided with a distinct concavity but others

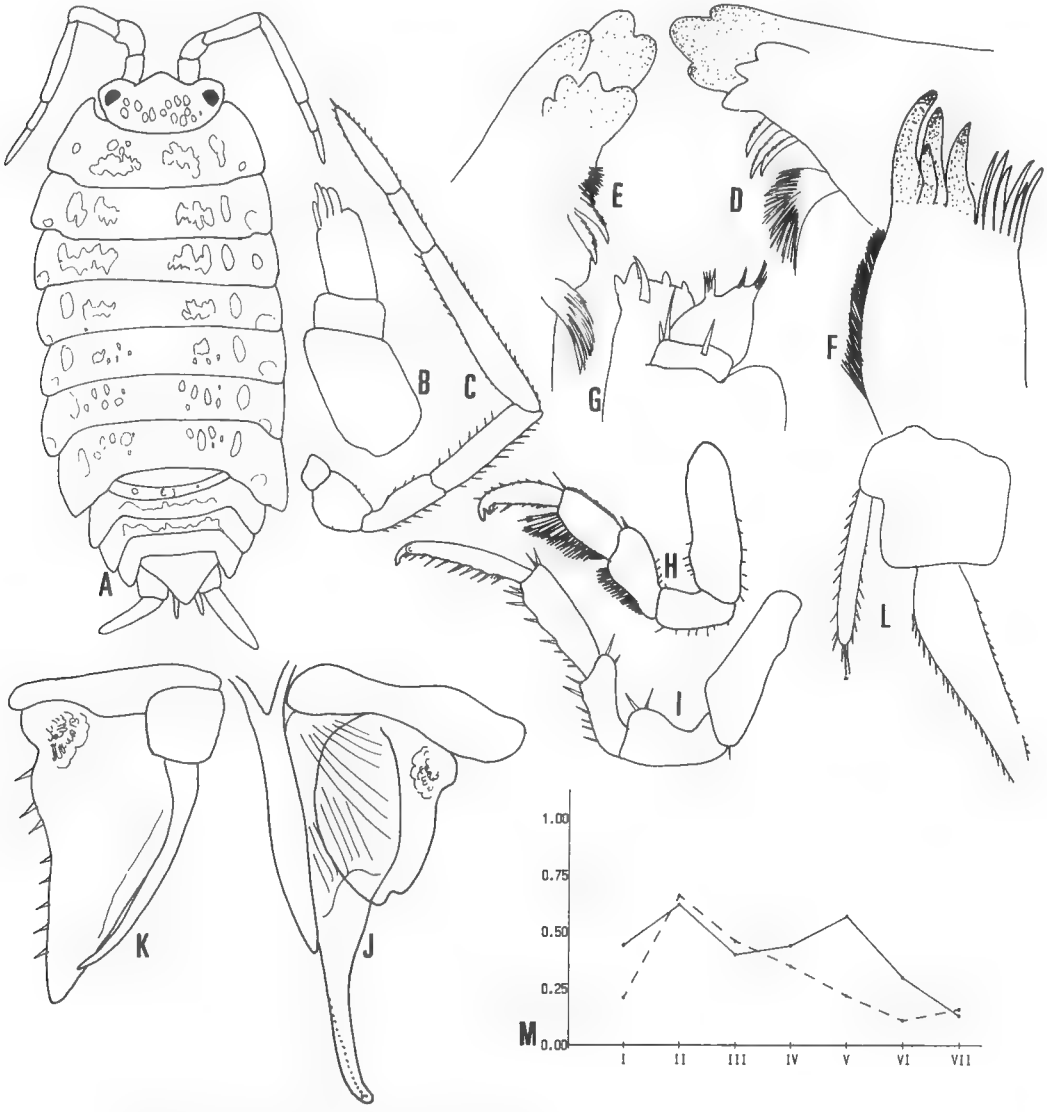

Fig. 106. *Nagurus gigliotosi* (ARCANGELI, 1927)

A. Dorsal view ; B. First antenna ; C. Second antenna ; D. Right mandible ; E. Left mandible ; F. Outer lobe of first maxilla ; G. Maxilliped ; H. First peraeopod ; I. Seventh peraeopod ; J. Penes and male first pleopod ; K. Male second pleopod ; L. Uropod ; M. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All : Holotype male).

collected in the same locality are without conspicuous concavity. The specimens from Oki Island are without concavity, either. Perhaps these might be of individual variation, for other features agree well with the original description.

***Nagurus nishimurai* n. sp.**

(Jap. name : Satoyama-warajimushi, new)

Fig. 107

Material examined ; 3♂♂ (1♂ holotype, 9.5mm in body length and 2♂♂ paratypes, 7.0～8.5mm in body length) and 7♀♀ (1♀ allotype, 9.1mm in body length and 6♀♀ paratypes, 8.2～9.9mm in body length), from the litter, Rinkai, Seto, Shirahama-chô, Wakayama-Pref., coll. Noboru Nunomura, May 18, 1976 ; 9♀♀, Ôura, Shirahama-chô, Wakayama Pref., coll. Noboru Nunomura, Mar. 16, 1978 ; 5♀♀, Torinosu, Tanabe City, Wakayama Pref., coll. Noboru Nunomura, May 25, 1975 ; 3♂♂ 1♀, Sen'ri, Minabe-chô, Hidaka-gun, Wakayama Pref., coll. Noboru Nunomura, Apr. 5, 1975 ; 2♂♂ 3♀♀, Fujishirozaka, Kainan City, Wakayama Pref., coll. Yoshiaki Nishikawa, Oct. 23, 1976 ; 2♂♂ 5♀♀, Tomogashima, Wakayama City, Wakayama Pref., coll. Noboru Nunomura, May 22, 1976 ; 6♀♀, Kamuro, Hashimoto City, Wakayama Pref., coll. Yasuhiko Shibata, Feb. 4, 1960 ; 1♂ 1♀, Yoshino-yama, Yoshino-chô, Yoshino-gun, Nara Pref., coll. Noboru Nunomura, May, 5, 1975 ; 1♂ 2♀♀, Oshima, Kashiwara City, Osaka Pref., coll. Yasumi Fujita, Sep. 23, 1975 ; 2♂♂ 18♀♀, Endo, Higashiura-chô, Tsuna-gun, Hyogo Pref., coll. Yoshiaki Nishikawa, Dec. 11, 1976 ; 2♂♂ 2♀♀, Murata, Tosu City, Saga Pref., coll. Yoshiaki Nishikawa, Dec. 11, 1976 ; 3♂♂ 3♀♀, between Nagahama and Ashihara, Shimokoshiki-son, Satsuma-gun, Kagoshima Pref., coll. Yasuhiko Shibata, May 7, 1976 ; 1♂ 9♀♀, Muroto City, Kochi Pref., coll. Jirô Tsukamoto, Sep. 1982 and many additional specimens from various localities of southern Japan. Type series is deposited as follows : holotype (TOYA-Cr-6563), allotype (TOYA-Cr-6564) and a paratype (TOYA-Cr-6565) at the Toyama Science Museum ; 2 paratypes (OMNH-Ar-3077～3078) at the Osaka Museum of Natural History ; 2 paratypes (YCM-CI-930～931) at the Yokosuka City Museum ; 2 paratypes (NSMT-Cr-9340) at the National Science Museum, Tokyo.

Description : Body 2.3 times as long as wide. Body colour brown with paler irregular patterns. Cephalon with well-developed lateral lobes, medial process triangular. Eyes mediocre in size, each eye with about 20 ocelli. Each pereaonal somite subequal in length. All the peraeonal somites without any concavity on the posterior margin. Neopleuron of pleonal somites well developed. Pleotelson triangular ; sides concave, tip pointed. Noduli lateralis on peraeonal somites II-III are remote from lateral margins (Fig. 107 O).

First antenna (Fig. 107 B) ; first segment rectangular ; second segment square ; terminal segment rectangular with 2～3 aesthetascs at the tip.

Second antenna (Fig. 107 C), reaching the posteior margin of secnd peraeonal somite. Flagellum 90% as long as the fifth peduncular segment, second segment 1.2 times as long as

the first.

Right mandible (Fig. 107 D); pars incisiva 3-headed; lacinia mobilis single-toothed; 3 hairy bristles between lacinia mobilis and processus molaris.

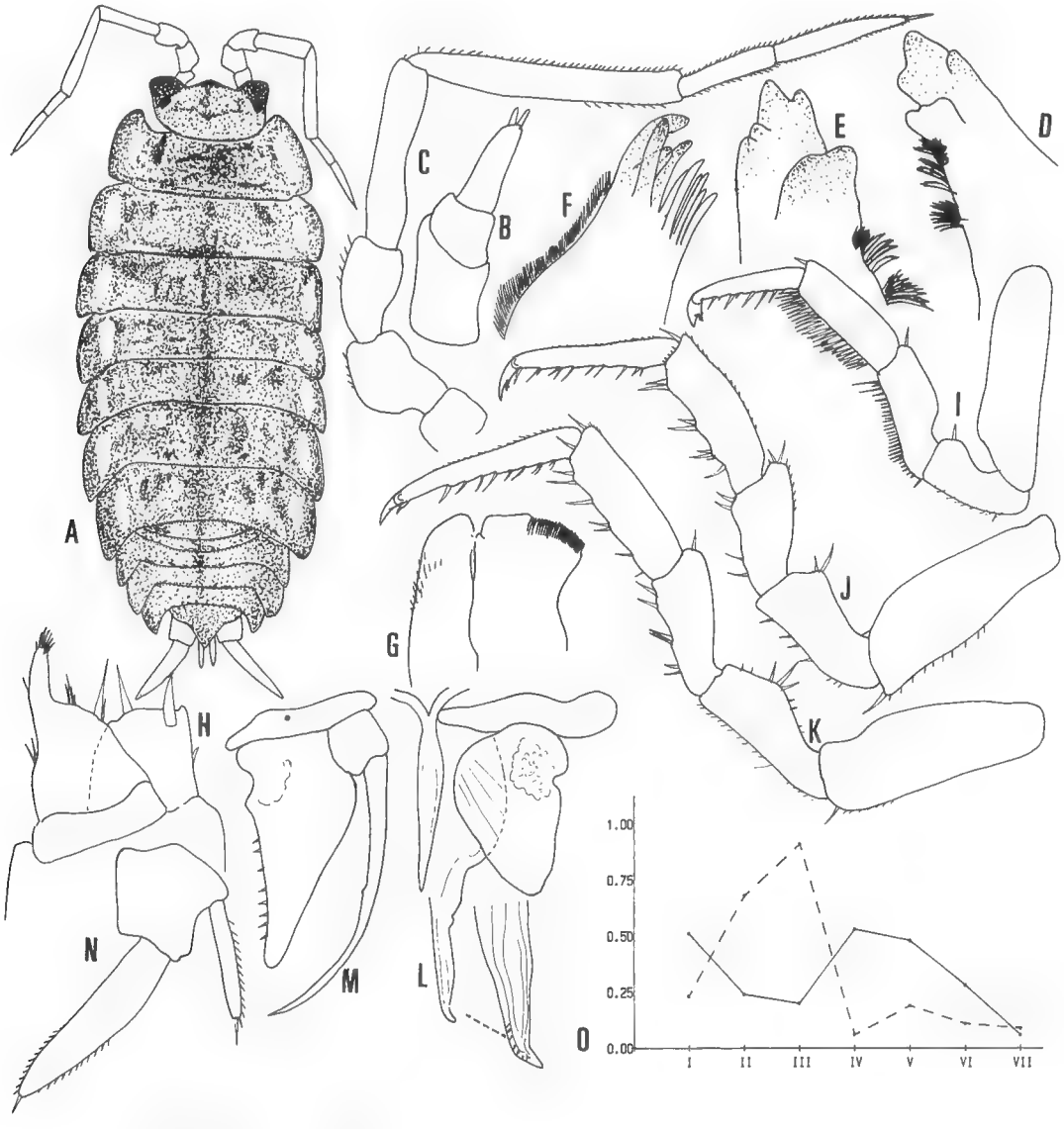

Fig. 107. *Nagurus nishimurai* n. sp.

A. Dorsal view; B. First antenna; C. Second antenna; D. Right mandible; E. Left mandible; F. Outer lobe of first maxilla; G. Second maxilla; H. Maxilliped; I. First peraeopod; J. Sixth peraeopod; K. Seventh peraeopod; L. Penes and male first pleopod; M. Male second pleopod; N. Uropod; O. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All: Holotype male).

Left mandible (Fig. 107 E); pars incisiva 4-headed; lacinia mobilis single-toothed; 4 hairy bristles between lacinia mobilis and processus molaris.

First maxilla (Fig. 107 F); outer lobe with 10 (4+6) entire teeth at the tip.

Second maxilla (Fig. 107 G) bilobed with relatively wide dental part.

Maxilliped (Fig. 107 H); endite rather narrow, with 2 spines; palp stout.

First to third peraeopods (Fig. 107 I); basis oblong; ischium rectangular; merus and carpus rectangular with many setae densely; propodus short with 7～8 setae on inner margin.

Fourth to sixth peraeopods (Fig. 107 J); basis oblong; ischium, merus and carpus rectangular with 7～8 setae on inner margin; propodus 8～9 setae on inner margin.

Seventh peraeopod (Fig. 107 K); basis oblong; ischium oblong with a low sternal margin and bears 2 setae; merus rectangular with 3 pairs of 2 setae on inner margin and a seta at distal outer corner; carpus rectangular with 8～10 setae on inner margin; propodus long with 7～10 setae on inner margin.

Penes (Fig. 107 L) slender and club-shaped.

Male first pleopod (Fig. 107 M); endopodite almost linear with a small concavity and bears 7～8 small spines near the apical part; exopodite lanceolate-oblong with a small concavity at basal outer part.

Male second pleopod (Fig. 107 M); endopodite elongated trinagular with 7～8 spines on outer margin; endopodite almost straight.

Uropod (Fig. 107 N); basis pentagonal; endopodite narrow; exopodite stout and 1.7 times as long as wide.

Remarks: The present new species seems to be most closely allied to *Nagurus gigliotosi* described from several localities including Kobe, San'in District, Korea and China but the former is separated from the latter in the following features: (1) shape of exopodite of male first pleopod, especially presence of small concavity on the basal part of outer margin, (2) noduli lateralis on peraeonal somites II and III are remote from the lateral margin, and (3) presence of concavity of the outer margin of pleotelson.

***Nagurus hachijoensis* n. sp.**

(Jap. name: Hachijô-hayashi-warajimushi, new)

Fig. 108

Material examined: 2♂♂ (1♂ holotype, 9.5mm in body length and 1♂ paratype, 4.8mm in body length) and 5♀♀ (1♀ allotype, 10.6mm in body length and 4♀♀ paratypes, 5.3～6.5mm in body length), Hachijo-Island, Tokyo Pref., coll. Hiroyasu Kato, Aug. 26, 1979. Type series is deposited as follows: holotype (TOYA-Cr-6712), allotype (TOYA-Cr-6713) and 2 paratypes (TOYA-Cr-6714～6715) at the Toyama Science Museum, a paratype (OMNH-Ar-3087) at the Osaka Museum of Natural History, a paratype (YCM-CI-937) at the Yokosuka City Museum and a paratype (NSMT-Cr-9344) at the National Science Museum, Tokyo.

Description: Body wide, 1.8 times as long as wide. Body colour brown with a pair of

paler lateral patterns and paler irregular patterns. Body surface weakly granulated. Cephalon with triangular medial process and rectangular lateral lobes. Eyes relatively small, each eye composed of 15 ocelli. All the peraeonal somites subequal in length. Posterolateral margin of first peraeonal somite concave. Pleonal somite also wide, with well developed neopleurons. Pleotelson triangular, with round tip. Noduli lateralis on peraeonal somites II-IV are remote from the lateral margin.

First antenna (Fig. 108 B) ; first segment big and rectangular ; second segment small and square ; terminal segment short with 7～8 aesthetscs at the tip.

Second antenna (Fig. 108 C), reaching the third peraeonal somite, mutual length of second to fifth peduncular segment is 2 : 3 : 4 : 11. Flagellum is 82% as long as fifth pedungular segment ; two flagellar segments are subequal in length.

Right mandible (Fig. 108 D) ; pars incisiva 4-headed ; lacinia mobilis 3-headed ; processus molaris with a tuft of setae.

Left mandible (Fig. 108 E) ; pars incisiva 4-headed ; lacinia mobilis single-toothed ; 3 hairy bristles between lacinia mobilis and processus molaris.

First maxilla (Fig. 108 F) ; outer lobe 10 (4+6) teeth at the tip. All of them are entire one.

Second maxilla (Fig. 108 G) bilobed, with a relatively wide dental part.

Maxilliped (Fig. 108 H) ; endite with 2 spines and a large seta ; palp wide.

First peraeopod (Fig. 108 I) ; basis oblong ; ischium rectangular ; merus rectangular with many setae on inner margin ; carpus slightly longer than merus and with many setae on inner margin ; propodus relatively short with 4 teeth.

Second to fourth peraeopods (Fig. 108 J) ; basis oblong ; ischium rectangular with a weakly sternal margin ; merus with many setae on inner margin ; propodus 7～8 setae on inner margin.

Fifth to seventh peraeopods (Fig. 108 K-L) slightly longer than the preceding ones ; basis oblong with a low sternal part ; ischium with a sternal margin; merus rectangular ; carpus nearly twice as long as merus, with 3 longer setae and 7～8 shorter setae on inner margin : propodus long and with 7～8 setae on inner margin.

Penes (Fig. 108 M) fusiform.

Male first pleopod (Fig. 108 M) ; endopodite straight and apical part bent outwards ; exopodite lanceolate-oblong, with shallow concavity on basal outer part.

Male second pleopod (Fig. 108 N) ; endopodite long, slightly recurved outwards ; exopodite elongated triangular without remarkable concavity but with 10～11 denticles on outer margin.

Uropod (Fig. 108 O) ; basis stout and square ; endopodite narrow and linear ; exopodite relatively stout, almost twice as long as endopodite.

Remarks : The present new species is apparently most closely allied to *Nagurus nishimurai* already described in this paper, but the former is separable from the latter in the

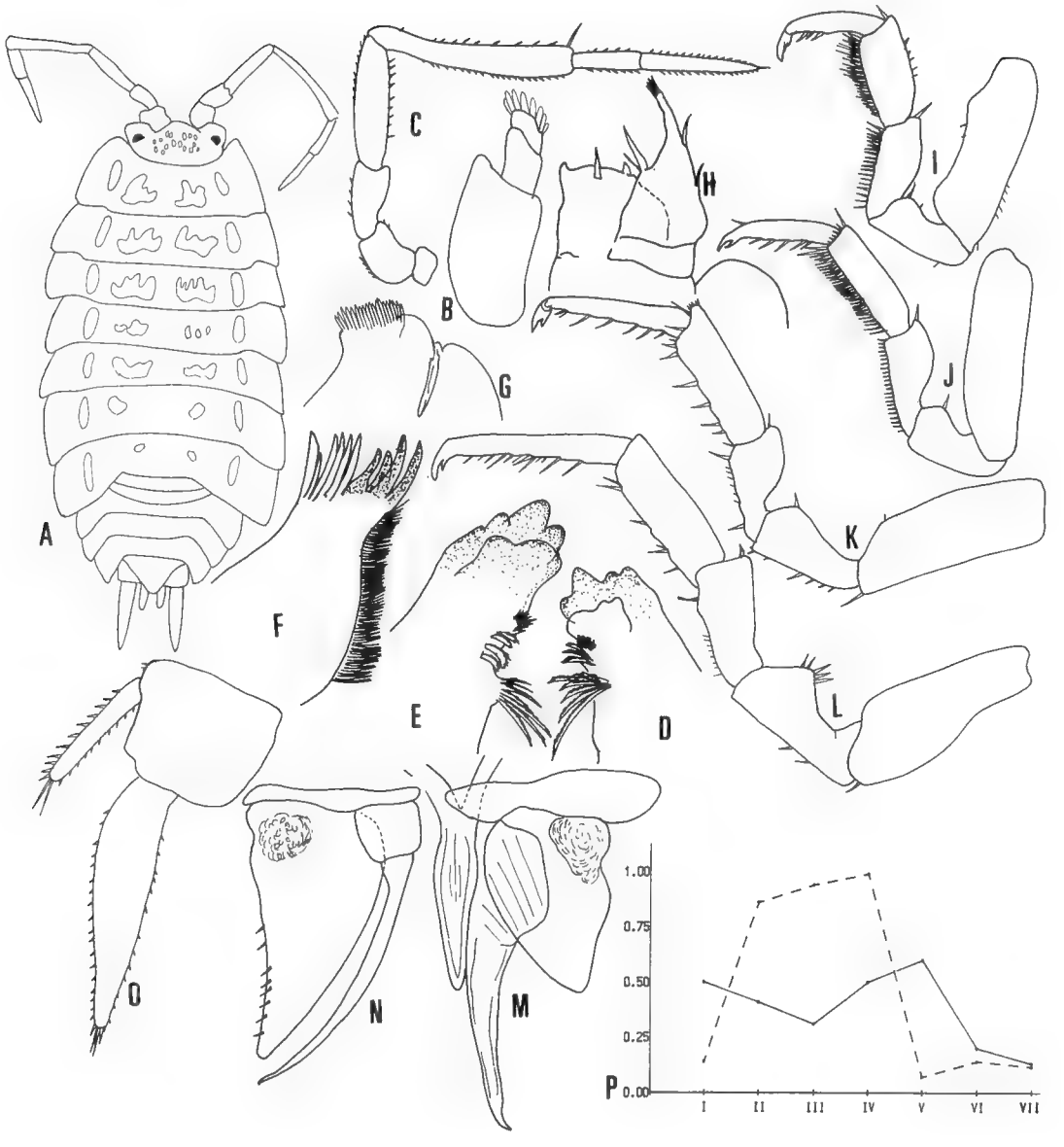

Fig. 108. *Nagurus hachijoensis* n. sp.

A. Dorsal view ; B. First antenna ; C. Second antenna ; D. Right mandible ; E. Left mandible ; F. Outer lobe of first maxilla ; G. Second maxilla ; H. Maxilliped ; I. First peraeopod ; J. Third peraeopod ; K. Fifth peraeopod ; L. Seventh peraopod ; M. Penes and male first pleopod ; N. Male second pleopod ; O. Uropod ; P. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All : Holotype male).

following features: (1) wider body shape, (2) more numerous aesthetascs at the tip of first antenna, and (3) lack of concavity on pleotelson.

Nagurus tokunoshimaensis, n. sp.

(Jap. name: Amami-ana-warajimushi, new)

Fig. 109

Material examined: 1♂ (holotype 5.3mm in body length) and 1♀ (allotype, 3.2mm in body length), from a cave called "Kenbu-i", Tokuno-shima, Ôshima-gun, Kagoshima Pref., coll. Matsuei Shimojana, Aug. 2, 1972. Holotype (TOYA-Cr-6749) and allotype (TOYA-Cr-6750) are deposited at the Toyama Science Museum.

Description: Body 2.0 times as long as as wide. Body colour creamy white in alcohol. Body surface granulated. Cephalon with a low medial projection and a small lateral projection. Eyes small, each eye composed of about 6 ocelli. Each peraeonal somite subequal in length. Posterolateral margins of peraeonal somites I-IV concave. Each pleonal somite subequal in length. Pleotelson triangular, as long as wide. Noduli lateralis on peraeonal somite I is remote from the lateral margin (Fig. 109 L).

First antenna (Fig. 109 B); first segment square; second segment short; terminal segment rectangular with 4 short aesthetascs at the tip.

Second antenna (Fig. 109 C), reaching the anterior part of the third peraeonal somite, mutual length of second to fifth segment is 4 : 4 : 7 : 10. Flagellum, as long as the fifth peduncular segment; second segment 2.0 times as long as the first.

Right mandible (Fig. 109 D); pars incisiva 3-headed; lacinia mobilis 2-headed; a hairy bristle between lacinia mobilis and processus molaris.

Left mandible; pars incisiva 3-headed; lacinia mobilis 2-headed; 2 hairy bristles between lacinia mobilis and processus molaris.

First maxilla (Fig. 109 E); outer lobe with 10 (4+6) teeth at the tip.

Second maxilla (Fig. 109 F) bilobed, dental area rather narrow.

Maxilliped (Fig. 109 G); endite round with 2 spines and a seta, palp rather narrow.

Seventh peraeopod (Fig. 109 H); basis oblong; ischium with a sternal margin bearing 3 setae; merus and carpus are rectangular and eqaul in length; propodus a little longer than carpus, with 7~8 setae on inner margin.

Penes (Fig. 109 I) narrow.

Male first pleopod (Fig. 109 I); endopodite straight but apical part slightly bents outwards; exopodite almost semicirciular, inner margin with 2 shallow concavities.

Male second pleopod (Fig. 109 J); endopodite narrow and long; exopodite triangular with 3 spines sparsely.

Uropod (Fig. 109 K); basis almost square; endopodite with relatively long setae on the distal half; exopodite 1.5 times as long as endopodite.

Remarks: The present new species is most closely allied to *Nagurus nishimurai* already

described in this paper, but the former is separated from the latter in the following features: (1) paler body colour, (2) smaller eyes and less numerous ocelli, and (3) noduli lateralis on peraeonal somites I and V are rather remote from the lateral margin but those on peraeonal somites II and III are near the lateral margin.

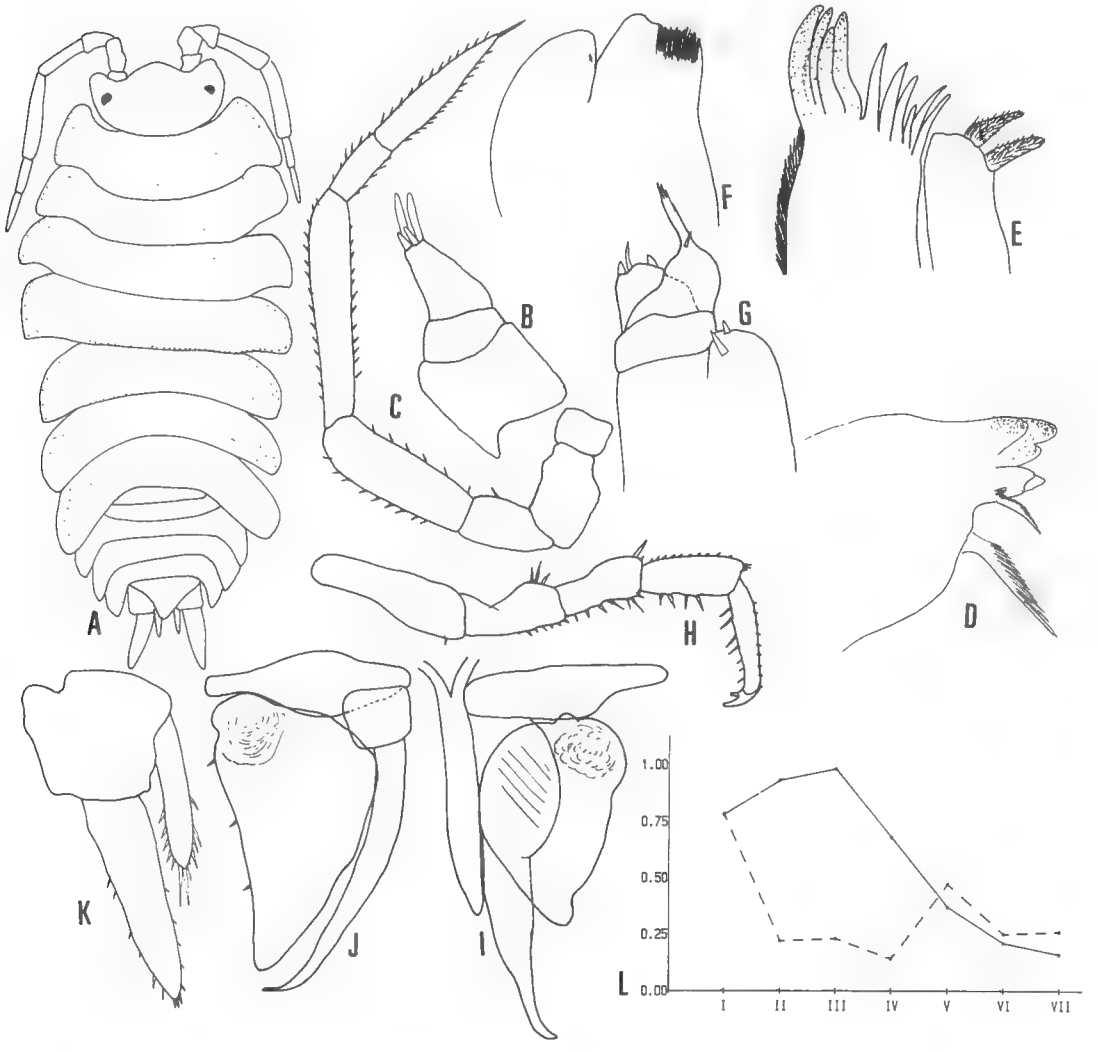

Fig. 109. *Nagurus tokunoshimaensis* n. sp.

A. Dorsal view; B. First antenna; C. Second antenna; D. Left mandible; E. First maxilla; F. Second maxilla; G. Maxilliped; H. Seventh peraeopod; I. Penes and male first pleopod; J. Male second pleopod; K. Uropod; L. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All: Holotype male).

Nagurus sakimori n. sp.

(Jap. name : Sakimori-hayashi-warajimushi, new)

Fig. 110

Material examined : 3♂♂ (1♂ holotype, 8.1mm in body length and 2 ♂♂, paratypes 8.0 ~8.5mm in body length) and 7♀♀ (1♀ allotype, 7.9mm in body length and 6♀♀, paratypes 6.2~9.0mm in body length), Mahoshigahama, Mitsushima-chô, Shimoagata-gun, Tsushima Island, Nagasaki Pref., coll. Noboru Nunomura, Oct. 13, 1986 ; 6 ♀♀, Kechi-ura, Mitsushima-chô, Shimoagata-gun, Tsushima Island, Nagasaki Pref., coll. Noboru Nunomura, Oct. 12, 1986. Type series is deposited as follows : holotype (TOYA-Cr-6513), allotype (TOYA-Cr-6514) and 2 paratypes (TOYA-Cr-6515~6516) at the Toyama Science Museum, 2 patratypes (OMNH-Ar-3070~3071) at the Osaka Museum of Natural History, 2 paratypes (YCM-CI-923~924) at Yokosuka City Museum and 2 paratypes (NSMT-Cr-9237) at the National Science Museum, Tokyo.

Description : Body oval-lanceolate, 2.1 times as long as wide. Body colour brown with paler irregular patterns. Body surface slightly granulated. Cephalon with a triangular medial process and well developed lateral lobes. Eyes mediocre in size, each eye with about 15 ocelli. Peraeonal somites I-II with concave posterolateral angle. Pleotelson triangular with remarkably concave sides and rounded apex. Noduli lateralis on all the peraeonal somites are not so remote from the lateral margins. (Fig. 110 M).

First antenna (Fig. 110 B) ; first segment rectangular ; second segment rather short ; third segment rectangular with 6 aesthetascs at the tip.

Second antenna (Fig. 110 C), reaching the posterior margin of the second peraeonal somite ; mutual length of first to fifth peduncular segments is 2 : 4 : 4 : 8 : 13. Flagellum is about 83% as long as the fifth peduncular segment ; terminal segment is slightly longer than the basal segment.

Right mandible (Fig. 110 D) ; pars incisiva 3-headed ; lacinia mobilis single-toothed ; 3 hairy bristles between lacinia mobilis and processus molaris.

Left mandible ; pars incisiva 4-headed ; lacinia mobilis 3-headed ; 3 hairy bristles between lacinia mobilis and processus molaris.

First maxilla (Fig. 110 E) ; outer lobe 10 (4+6) entire teeth at the tip.

Second maxilla (Fig. 110 F) bilobed dental part pretty wide.

Maxilliped (Fig. 110 G) ; endite rectangular with 2 spines and a strong tooth ; palp fairly slender.

First peraeopod (Fig. 110 H) ; basis oblong ; ischium rectangular with 5~6 setae on inner margin ; carpus rectangular with many setae on inner margin ; carpus rectangular, as long as merus, with many setae on inner margin ; propodus with 3 bigger setae and a row of smaller setae on inner margin.

Seventh peraeopod (Fig. 110 I) ; basis oblong ; ischium with a sternal margin bearing 2 setae ; merus rectangular ; carpus 1.5 times as long as wide with 7~8 strong setae and several

small setae ; propodus relatively long.

Penes (Fig. 110 J) fusiform.

Male first pleopod (Fig. 110 J) ; endopodite straight and its apical part bent outwards ; exopodite almost rectangular, with 2 small concavities, apical part round.

Male second pleopod (Fig. 110 K) ; endopodite straight but relatively short, not extending

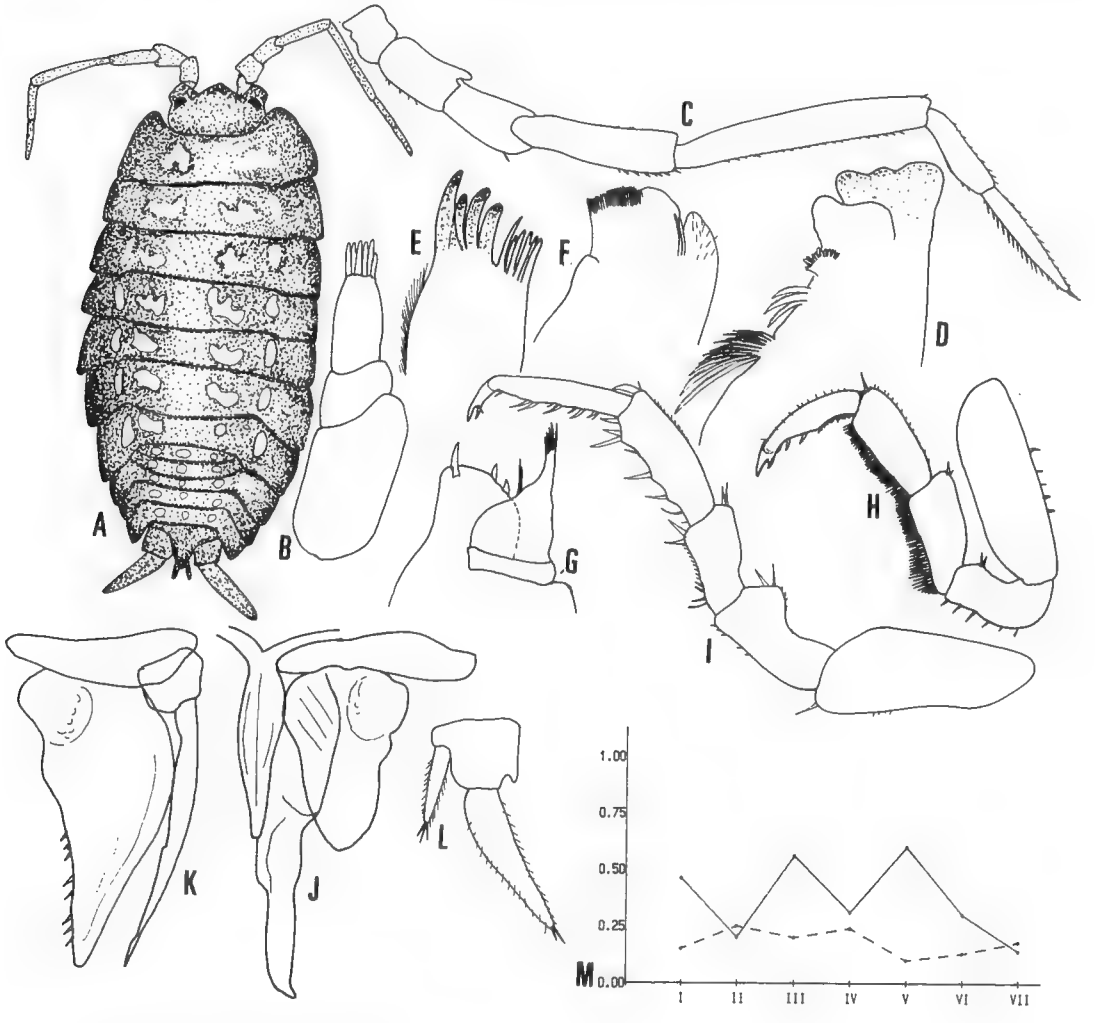

Fig. 110. *Nagurus sakimori* n. sp.

A. Dorsal view ; B. First antenna ; C. Second antenna ; D. Right mandible ; E. Outer lobe of first maxilla ; F. Second maxilla ; G. Maxilliped ; H. First peraeopod ; I. Seventh peraeopod ; J. Penes and male first pleopod ; K. Male second pleopod ; L. Uropod ; M. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All : Holotype male).

beyond the exopodite ; exopodite elongated triangular with 9～10 spines on outer margin.

Uropod (Fig. 110 L) ; basis almost square ; endopodite narrow and linear ; exopodite about twice as long as endopodite.

Remarks : The present new species is most closely allied to *Nagurus nishimurai* already described in this paper, but the former is separated from the latter in the following features : (1) shape of male first pleopod, especially absence of small concavity on basal part of outer margin, (2) noduli lateralis on all the peraeonal somites are near the lateral margin, and (3) more numerous aesthetascs at the tip of first maxilla.

Nagurus maculatus (IWAMOTO, 1943)

(Jap. name : Fuiri-warajimushi)

Fig. 111

Porcellio maculatus IWAMOTO, 1943 ; ————, NUNOMURA, 1980.

Material examined : 3♂♂ 2♀♀, Hattori-ryokuchi, Toyonaka City, Osaka Pref., coll. Noboru Nunomura, Oct. 20, 1974.

Description : Body oval-lanceolate, 2.1 times as long as wide. Body brown with a pair of lateral paler patterns and many paler irregular patterns in medial part. Body surface smooth. Cephalon with a low and round medial process and a pair of rectangular lateral projections. Eyes mediocre in size, each with 15～16 ocelli. Each peraeonal somite subequal in length and all the posterolateral margins of first peraeonal somite round. Pleotelson triangular. Position of noduli lateralis on all the peraeonal somites are near the lateral margin (Fig. 111 M).

First antenna (Fig. 111 B) ; first segment relatively big and rectangular ; second segment square ; terminal segment relatively short with 2 aesthetascs at the tip.

Second antenna (Fig. 111 C), reaching the second peraeonal somite, second flagellar segment about 3 times as long as the first.

Right mandible (Fig. 111 D) ; pars incisiva 3-headed ; lacinia mobilis single-toothed ; 3-hairy bristles between lacinia mobilis and processus molaris.

Left mandible (Fig. 111 E) ; pars incisiva 4-headed ; lacinia mobilis single-toothed ; 3～4 hairy bristles between lacinia mobilis and processus molaris.

First maxilla (Fig. 111 F) ; outer lobe with 10 (4+6) entire teeth.

Second maxilla (Fig. 111 G) bilobed ; dental area relatively wide.

Maxilliped (Fig. 111 H) ; endite with 2 big spines ; palp short but wide.

First peraeopod ; basis oblong ; ischium rectangulr with 3～4 setae on inner margin ; merus and carpus rectangular with many long setae on inner margin ; propodus relatively short with 3 strong setae and a row of small denticles.

Seventh peraeopod (Fig. 111 I) ; basis oblong ; ischium with a big sternal margin bearing with 2～3 setae ; merus and carpus rectangular with 8～12 setae on inner margin ; propodus long.

Penes (Fig. 111 J) fusiform.

Male first pleopod (Fig. 111 J); endopodite straight but apical part bent outwards; exopodite almost rectangular with a shallow concavity on distal margin, a denticle at the inner distal corner, and sinuate distal half of outer margin.

Male second pleopod (Fig. 111 K); endopodite long; exopodite triangular with 9 setae of outer margin.

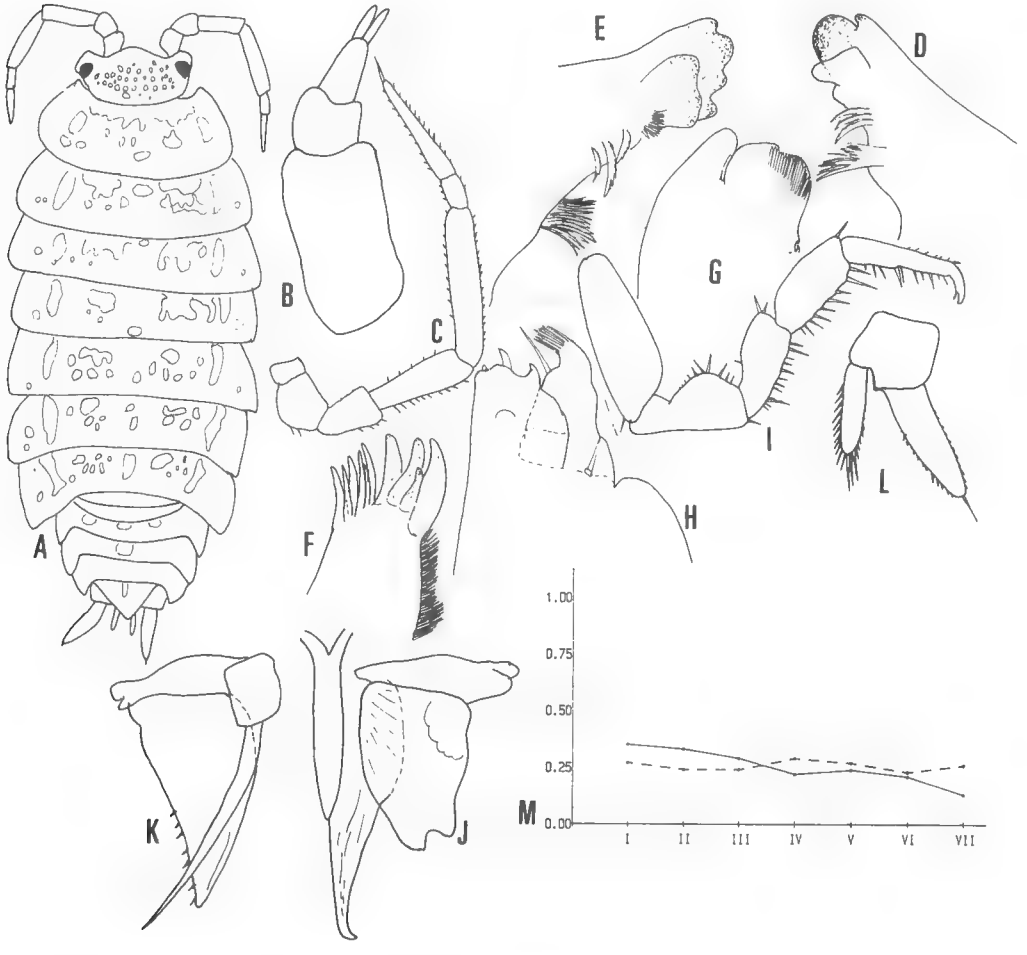

Fig. 111. *Nagurus maculatus* (IWAMOTO, 1943)

A. Dorsal view; B. First antenna; C. Second antenna; D. Right mandible; E. Left mandible; F. Outer lobe of first maxilla; G. Second maxilla; H. Maxilliped; I. Seventh peraeopod; J. Penes and male first pleopod; K. Male second pleopod; L. Uropod; M. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All: Male sepcimens collected at the Toyonaka City, Osaka Pref.).

Uropod (Fig. 111 L); basis rectangular; endopodite rather stout with a tuft of setae at the tip; exopodite stout and 1.4 times as long as endopodite.

Remarks: The specimens at disposal agree with Iwamoto's original description, especially in the shape of exopodite of male first pleopod. But the endopodite of male second pleopod on the specimens collected from Toyonaka have slightly longer than that of the original description.

Nagurus katakurai n. sp.

(Jap. name: Kogata-hayashi-warajimushi, new)

Fig. 112

Material examined: 3♂♂ (1♂ holotype, 4.6mm in body length and 2♂♂ paratypes, 4.8～5.2mm in body length) and 5♀♀ (1♀ allotype, 6.8mm in body length and 4♀♀ paratypes, 4.7～6.5mm in body length), Hiyoshi, Kôhoku-ku, Yokohama-City, Kanagawa Pref., coll. Yasutoshi Katakura; 2♂♂ 6♀♀, Kôrakuen, Bunkyo-ku, Tokyo Pref., coll. Akinori Kosaku. Type series is deposited as follows: holotype (TOYA-Cr-6721), allotype (TOYA-Cr-6722) and 2 paratypes (TOYA-Cr-6723～6724) at the Toyama Science Museum, 2 paratypes (OMNH-Ar-3088～3089) at the Osaka Museum of Natural History, a paratype (YCM-CI-938) at the Yokosuka City Museum and a paratype (NSMT- Cr-9345) at the National Science Museum, Tokyo.

Description: Body oval-oblong, about 2.2 times as long as wide. Body small and reaches only 6.8mm in length. Body colour blackish brown with a pair of longitudinal lateral paler patterns and smaller irregular patterns on the surface of peraeonal somites. Body surface smooth. Cephalon with triangular medial process and rectangular lateral projections. Eyes relatively small, each eye comoposed of 15 ocelli. Each peraeonal somite subequal in length; posterolateral margins of first to sixth somites nearly rectangular, but that of seventh somite somewhat protruded posteriorly. Noduli lateralis on peraeonal somites II-IV are remote from the lateral margin.

First antenna (Fig. 112 B); first big and almost square; second segment rather short; terminal segment slender, bearing 4 aesthetascs at the tip.

Second antenna (Fig. 112 C), reaching the anterior margin of the second peraeonal somite. Flagellum 90% as long as the fifth peduncular segment; second flagellar segment 3.5 times as long as the first.

Right mandible (Fig. 112 D); pars incisiva 3-headed; lacinia mobilis single-toothed; 3 hairy bristles between lacinia mobilis and processus molaris.

Left mandible; pars incisiva 2-headed; lacinia mobilis 2-headed; 4 hairy bristles between lacinia mobilis and processus molaris.

First maxilla; outer lobe with 10 (4+6) entire teeth at the tip.

Second maxilla (Fig. 112 E) bilobed and narrow.

Maxilliped (Fig. 112 F); endite with 3 spines and a strong seta; palp rather slender.

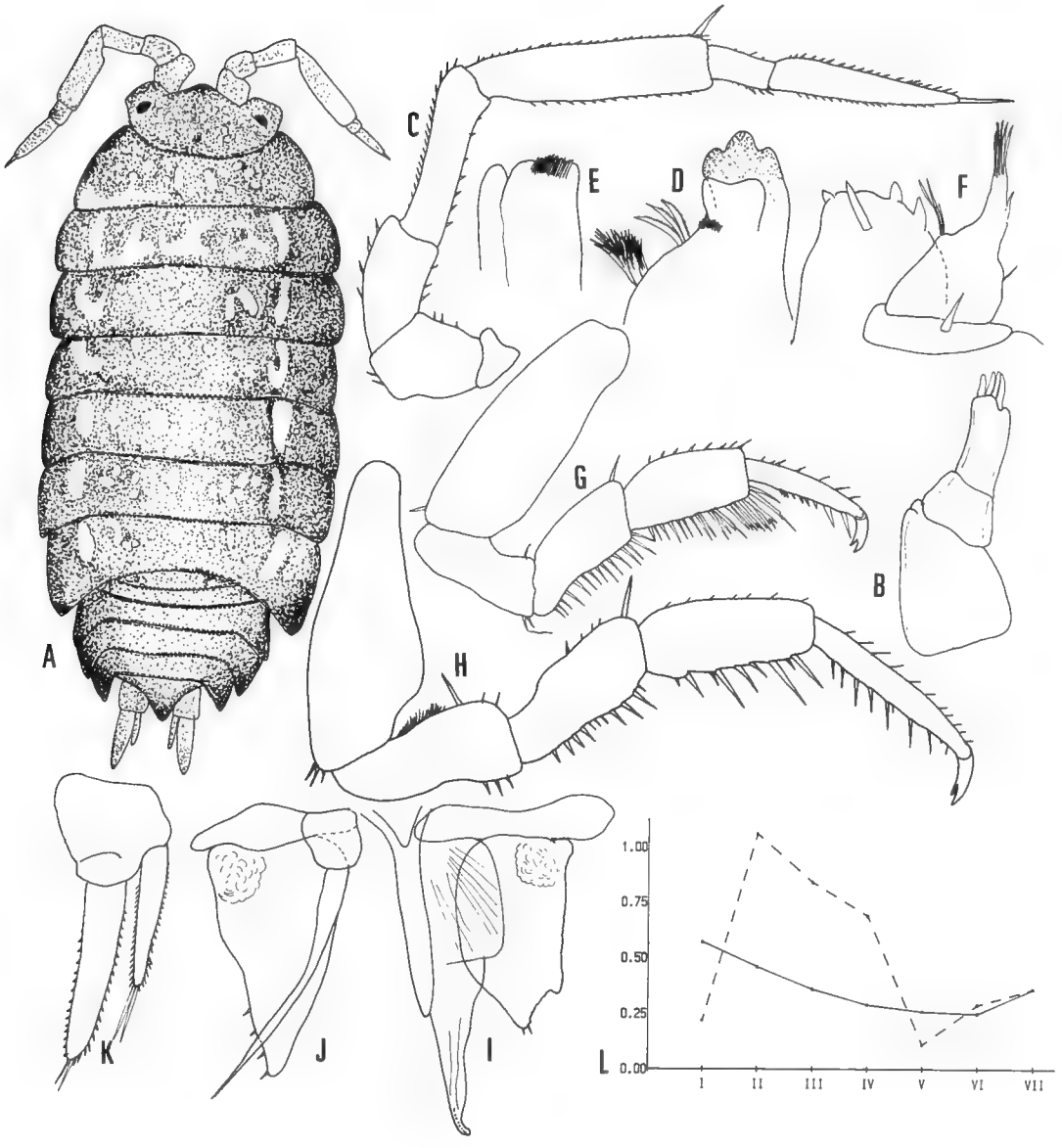

Fig. 112. *Nagurus katakurai* n. sp.

A. Dorsal view ; B. First antenna ; C. Second antenna ; D. Right mandible ; E. Second maxilla ; F. Maxilliped ; G. First peraeopod ; H. Seventh peraeopod ; I. Penes and male first pleopod ; J. Male second pleopod ; K. Uropod ; L. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All : Holotype male).

First peraeopod (Fig. 112 G) ; basis oblong ischium rectangular ; merus and carpus with many setae on inner margin ; propodus 7～9 setae on inner margin.

Seventh peraeopod (Fig. 112 H) ; basis rectangular with slightly swollen part, and bearing 3 spines at the inner distal corner ; ischium rather long with a strong setae and many thin setae on outer margin ; merus rectangular with 6～7 setae and several weaker setae on inner margin ; carpus as long as merus and with 6～7 strong setae on inner margin ; propodus 10 ～11 setae on inner margin.

Penes (Fig. 112 I) fusiform.

Male first pleopod (Fig. 112 I) ; endopodite straight, but apical part slightly bents outwards bearing 7～8 spinules ; exopodite almost rectangular with a wide but shallow concavity on distal margin, and a partly sinuate outer marigin ; endopodite straight, but apical part slightly bent outerwards bearing 7～8 spinules.

Male second pleopod (Fig. 112 J) ; endopodite long ; exopodite triangular without concavity and bears 4 spines at the tip.

Uropod (Fig. 112 K) ; basis almost square ; endopodite narrow ; exopodite relatively narrow and 1.5 times as long as endopodite.

Remarks : The present new species is most closely allied to *Nagurus maculatus* (Iwamoto, 1943) but the former is separable from the latter in the following features : (1) smaller body size, (2) wider but shallower concavity of exopodite of male first pleopod, and (3) noduli lateralis on peraeonal somites II-III are very remote from the lateral margin.

Nagurus tsushimaensis n. sp.

(Jap. name : Tsushima-warajimushi, new)

Fig. 113

Material examined : 3♂♂ (1♂ holotype, 8.8mm in body length and 2♂♂ paratypes, 7.2～9.4mm in body length) and 5♀♀ (1♀ allotype, 9.1mm in body length and 4♀♀ paratypes, 7.3～9.3mm in body length), Hitakatsu, Kamitsushima-chô, Kamiagata-gun, Tsushima Island, Nagasaki Pref., coll. Noboru Nunomura, Oct. 11, 1986 ; 1♂ 1♀, Inokuchihama, Kamiagata-chô, Kamiagata-gun, Tsushima Nagasaki Pref., coll. Noboru Nunomura, Oct. 12, 1986 ; 5♂♂ 5♀♀, Takahama, Mitsushima-chô, Tsushima Island, Nagasaki Pref., coll. Noboru Nunomura, Oct. 13, 1986. Type series is deposited as follows : holotype (TOYA-Cr-6543), allotype (TOYA-Cr-6544) and 2 paratypes (TOYA-Cr-6545～6546) at the Toyama Science Museum, 2 paratypes (OMNH-Ar-3090～3091) at the Osaka Museum of Natural History, a paratype (YCM-CI-939) at the Yokosuka City Museum and 2 paratypes (NSMT-Cr-9346) at the National Science Museum, Tokyo.

Description : Body oval-lanceolate, 2.1 times as long as wide. Body colour black with a pair of lateral paler patterns and many paler irregular patterns on the medial part. Body surface smooth. Cephalon with a triangular medial process ; lateral lobes small. Eyes relatively large, each eye composed of 25 ocelli. Each peraeonal somite subequal in length.

All the posterolateral corners without any concavity. Pleotelson triangular with straight margins. Noduli lateralis on peraeonal somite IV is relatively remote from the lateral margin (Fig. 113 M).

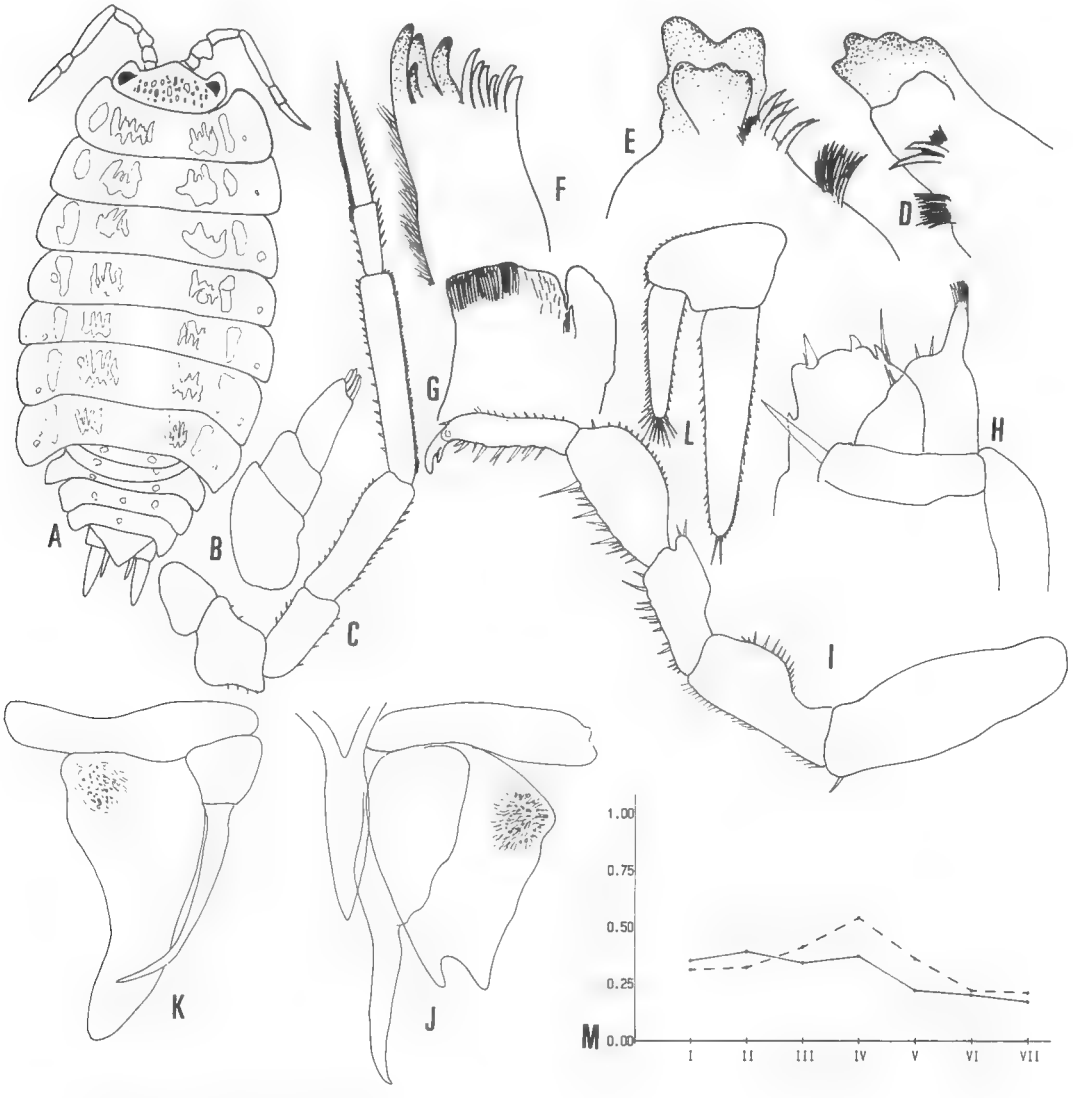

Fig. 113. *Nagurus tsushimaensis* n. sp.

A. Dorsal view ; B. First antenna ; C. Second antenna ; D. Right mandible ; E. Left mandible ; F. Outer lobe of first maxilla ; G. Second maxilla ; H. Maxilliped ; I. Seventh peraeopod ; J. Penes and male first pleopod ; K. Male second pleopod ; L. Uropod ; M. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All : Holotype male).

First antenna (Fig. 113 B); first segment big and rectangular; second segment rather short; terminal segment rectangular with 4 aesthetascs at the tip.

Second antenna (Fig. 113 C), reaching anterior part of the second peraeonal somite, mutual length of second to fifth peduncular segments is 2 : 2 : 4 : 5. Flagellum as long as the fifth peduncular segment; terminal segment twice as long as the basal one.

Right mandible (Fig. 113 D); pars incisiva 3-headed; lacinia mobilis slightly 3-headed; 3 hairy bristles between lacinia mobilis and processus molaris.

Left mandible (Fig. 113 E); pars incisiva 2-headed; lacinia mobilis slightly 3-headed; 4 hairy bristles between lacinia mobilis and processus molaris.

First maxilla (Fig. 113 F); outer lobe with 10 (4+6) entire teeth at the tip.

Second maxilla (Fig. 113 G) bilobed; dental area wide.

Maxilliped (Fig. 113 H); endite broad with 3 stout spines and a longer setae; palp relatively robust.

Seventh peraeopod (Fig. 113 I); basis oblong; ischium rectangular without distinct sternal margin; merus rectrangular; carpus rectangular but swollen on outer margin; propodus relatively short with 7～8 setae on inner margin.

Penes (Fig. 113 J) fusiform.

Male first pleopod (Fig. 113 J); straight but the apical part bent outwards; exopodite almost rectangular and relatively big concavity on distal margin.

Male second pleopod (Fig. 113 K); endopodite stout but very short, not exceedingly beyond the exopodite; exopodite elongated triangular.

Uropod (Fig. 113 L); basis rather short; endopodite narrow-lanceolate with dense hair on inner and distal margins; exopodite big, 1.5 times as long as endopodite.

Remarks : The present new species is provided with relatively smaller lateral lobes than those of the other species of the genus *Nagurus*, but they are not so small as in the typical species of the genus *Protracheoniscus*, it is a temporary measure that the present species was put into the genus *Nagurus*.

This species somewhat resembles, on the other hand, *Nagurus maculatus* (IWAMOTO) but the former is separated from the later in the following features : (1) swollen process on carpus of male seventh peraeopod, (2) smaller lateral lobes, (3) deeper concavity on exopodite of male first pleopod, and (4) shorter endopodite of male second pleopod.

***Nagurus luridus*, n. sp.**

(Jap. name : Shirayuki-hayashi-warajimushi, new)

Fig. 114

Material examined : 2♂♂ (1♂ holotype, 4.6mm in body length and 1♂ paratype, 3.9mm in body length) and 16♀♀ (1♀ allotype, 6.4mm in body length and 15♀♀ paratypes, 5.7～6.3mm in body length), Ogi, Uchiura-chô, Suzu-gun, Ishikawa Pref., coll. Noboru Nunomura, June 12, 1979. Type series is deposited as follows : holotype (TOYA-Cr-6703), allotype

(TOYA-Cr-6704) and 7 paratypes (TOYA-Cr-6705～6711) at the Toyama Science Museum, 3 paratypes (OMNH-Ar-3084～3086) at the Osaka Museum of Natural History, 3 paratypes (YCM-CI-934～936) at the Yokosuka City Museum and 3 paratypes (NSMT-Cr-9343) at the National Science Museum, Tokyo.

Description: Body lanceolate, about 2.4 times as long as wide. Body colour white. Body surface relatively smooth. Cephalon with a round medial process and a rectangular lateral lobes. Eyes rather small, each eye composed of about 20 ocelli. Posterolateral

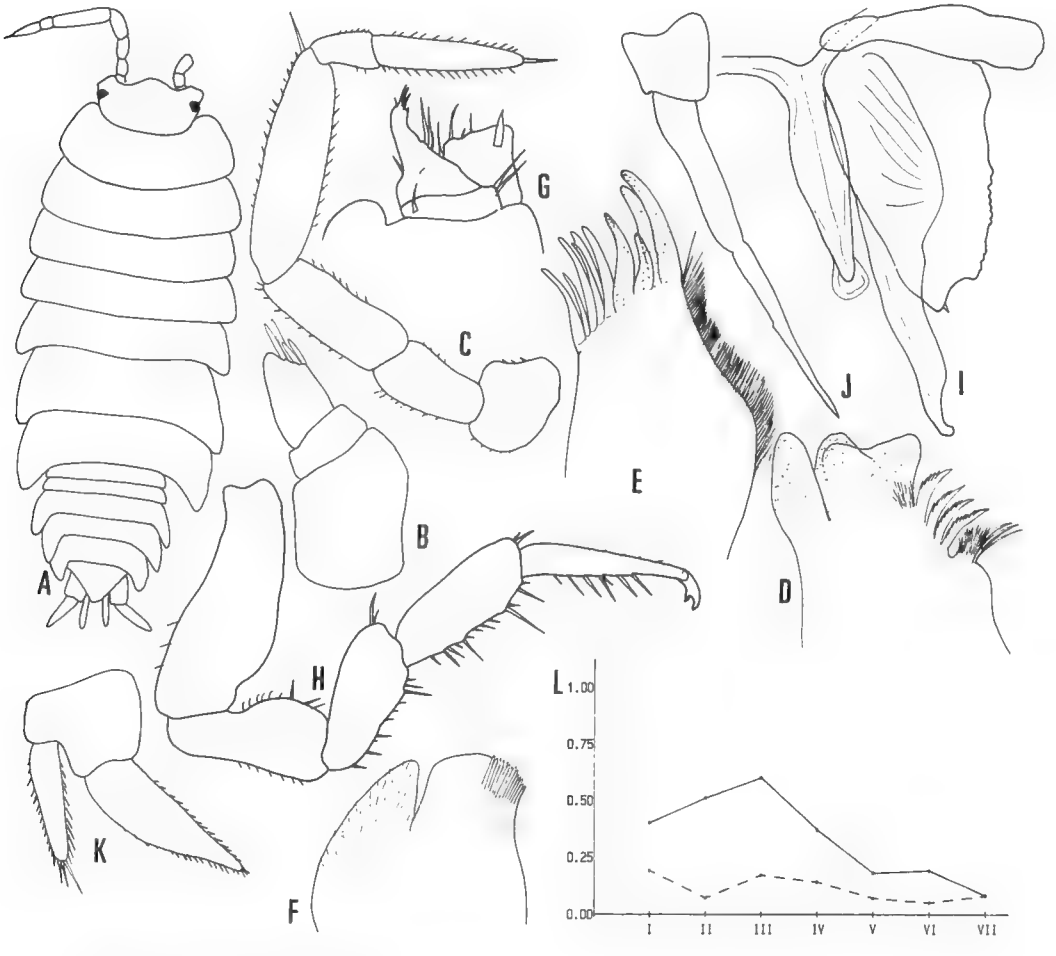

Fig. 114. *Nagurus luridus* n. sp.

A. Dorsal view ; B. First antenna ; C. Second antenna ; D. Left mandible ; E. Outer lobe of first maxilla ; F. Second maxilla ; G. Maxilliped ; H. Seventh peraeopod ; I. Penes and male first pleopod ; J. Endopodite of male second pleopod ; K. Uropod ; L. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All : Holotype male).

angles of first to four segments round. Pleotelson triangular, sides without concavity. Noduli lateralis on all the peraeonal somites are near to the lateral margin (Fig. 114 L).

First antenna (Fig. 114 B) ; first segment big and square ; second segment short ; terminal segment rectangular with 4 aesthetascs at the tip.

Second antenna (Fig. 114 C), reaching the anterior border of the third peraeonal somite, mutual length of first to fifth peduncular segments is 2 : 2 : 3 : 5. Flagellum as long as fifth peduncular segment and second segment 2.4 times as long as the first.

Right mandible ; pars incisiva 3-headed ; lacinia mobilis single-toothed, 4 hairy bristles between lacinia mobilis and processus molaris.

Left mandible (Fig. 114 D) ; pars incisiva 3-headed ; lacinia mobilis weakly 2-headed ; 4 hairy bristles between lacinia mobilis and processus molaris.

First maxilla (Fig. 114 E) ; outer lobe with 10 (4+6) teeth at the tip.

Second maxilla (Fig. 114 F) bilobed ; dental area rather narrow.

Maxilliped (Fig. 114 G) ; endite with a strong seta and a spine.

Seventh peraeopod (Fig. 114 H) ; basis oblong ; ischium without sternal margin ; merus triangular ; carpus rectangular with 3 longer and more than 10～12 shorter setae on inner margin. Propodus relatively long with 6 setae on inner margin.

Penes (Fig. 114 I) fusiform.

Male first pleopod (Fig. 114 I) ; exopodite rectangular, distal part with a shallow concavity and a small spine, outer margin partly sinuate ; endopodite almost straight, apical part slightly bent outerwards.

Male second pleopod (Fig. 114 J) ; endopodite straight.

Uropod (Fig. 114 K) ; basis square ; endopodite narrow ; exopodite stout and a little longer than the endopodite.

Remarks : The present new species is allied to *Nagurus tsushimaensis* already described in this paper, but the former is separable from the latter in the following features : (1) white body, (2) smaller eyes, (3) well developed lateral lobes of cephalon, (4) longer endopodite of male second pleopod, (5) shorter first segment of second antenna, and (6) shape of penes.

Nagurus boninshimensis n. sp.

(Jap. name :.Ogasawara-hayashi-warajimushi, new)

Fig. 115

Material examined : 1♂ (holotype, 8.1mm in body length) and 6♀♀ (1♀ allotype, 10.5mm in body length and 5♀♀ paratypes, 3.8～10.2mm in body length), near the top of Mt. Sakaiga-dake, Hahajima Island, Bonin Islands, Tokyo Pref., coll. Jun-ichi Aoki, June 24, 1977 ; 2♂♂ (paratypes 9.4～9.6mm in body length) and 5♀♀ (paratypes, 8.5～10.1mm in body length), Sekimonsan-Uenodan, Hahajima Island, Bonin Islands, Tokyo Pref., coll. Jun-ichi Aoki, June 24, 1977. Type series is depositesd as follows : holotype (TOYA-Cr-6683), allotype (TOYA-Cr-6684) and 6 paratypes (TOYA-Cr-6685～6690) at the Toyama Science

Museum, 2 paratypes (OMNH-Ar-3080～3081) at the Osaka Museum of Natural Hitory, 2 paratypes (YCM-CI-932～933) at the Yokosuka City Museum and 2 paratypes (NSMT-Cr-9341) at the National Science Museum, Tokyo.

Description: Body rather elongated, 2.4 times as long as wide. Body colour white. Cephalon round with triangular medial process and rectangular lateral lobes. Eyes rather

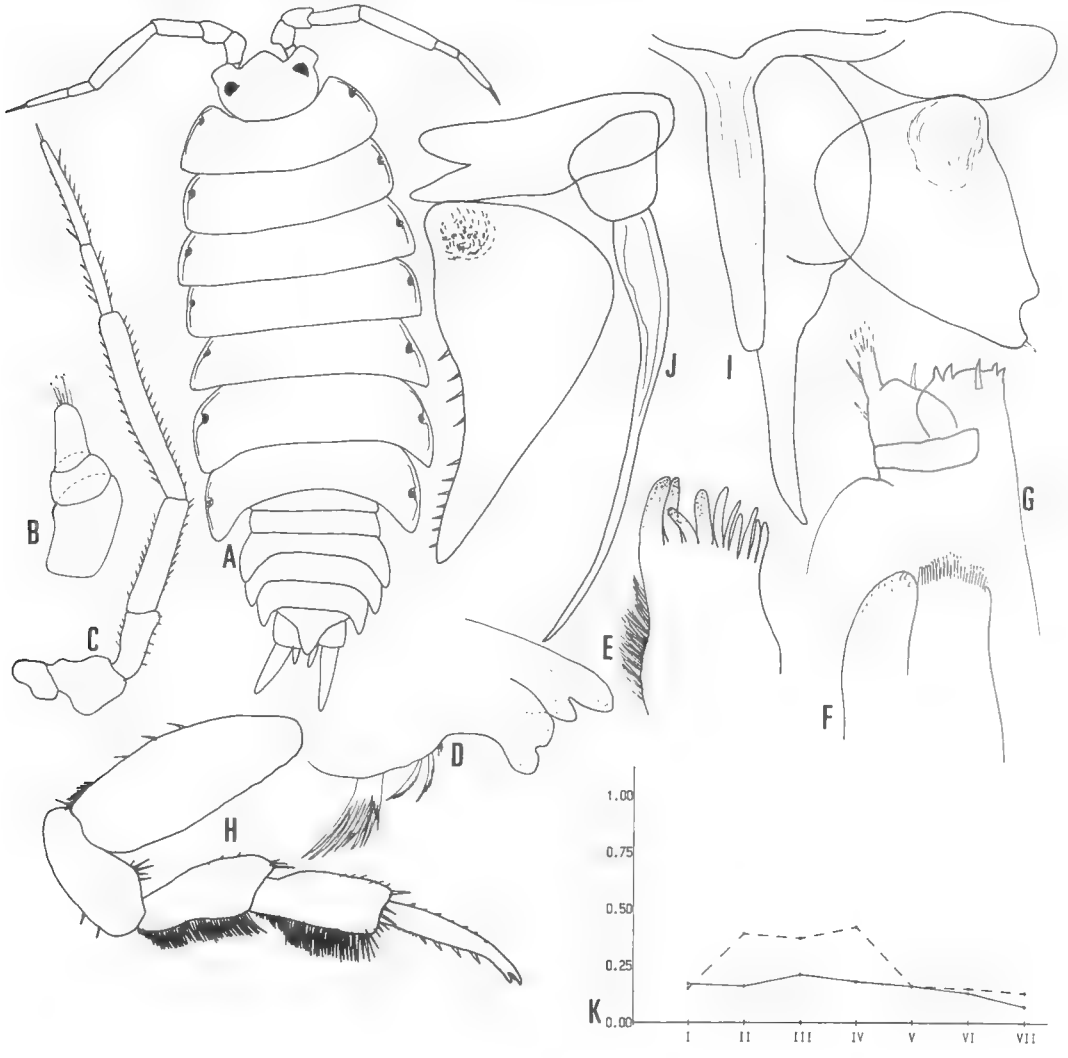

Fig. 115. *Nagurus boninshimensis* n. sp.

A. Dorsal view; B. First antenna; C. Second antenna; D. Left mandible; E. Outer lobe of first maxilla; F. Second maxilla; G. Maxilliped; H. Firtst peraeopod; I. Penes and male first pleopod; J. Male second pleopod; K. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All: Holotype male).

small, each composed of about 18 ocelli. Each peraeonal somite subequal in length. Posterolateral angles of cephalon round. Glandular part of each peraeonal somite, very conspicuous and round in shape, situated in the medial part of lateral margin of each peraeonal somite. Pleotelson triangular, sides slightly concave. Noduli lateralis is as Fig. 115 K.

First antenna (Fig. 115 B); first segment big; second segment short; terminal segment rectangular with 5 aesthetascs at the tip.

Second antenna (Fig. 115 C), reaching anterior margin of the third peraeonal somites; mutual length of second to fifth peduncular segments is 3 : 4 : 6 : 8. Flagellum a little shorter than fifth pedunclar segment; terminal segment 1.5 times as long as the basal segment.

Right mandible; pars incisiva 4-headed; lacinia mobilis single-toothed; 4 hairy bristles between lacinia mobilis and processus molaris.

Left mandible (Fig. 115 D); pars incisiva 2-headed, lacinia mobilis also 2-headed; 2～3 hairy bristles between lacinia mobilis and processus molaris.

First maxilla (Fig. 115 E); outer lobe with 10 (4+6) entire teeth at the tip.

Second maxilla (Fig. 115 F) bilobed and dental part wide.

Maxilliped (Fig. 115 G); endite with 4 spines and a strong teeth; palp relatively stout.

First peraeopod (Fig. 115 H); basis oblong; ischium rectangular with 4～6 sparse setae; merus and carpus rectangular with many long setae on inner margin; propodus long, with 4 setae on inner margin and 8～9 spines on outer margin.

Seventh peraeopod; basis stout; ischium long; merus rectangular with 9～10 setae on inner margin; carpus 1.5 times as long as merus, propodus long with 9～10 setae on inner margin.

Penes (Fig. 115 I) linear, tip is truncated.

Male first pleopod (Fig. 115 I); endopodite straight but apical part slightly bent outwards without any tooth; exopodite ovate with a shallow concavity and a spine on distal margin.

Male second pleopod (Fig. 115 J); endopodite long and slender exopodite long, with 10～12 spines on outer margin.

Uropod; basis square; endopodite linear; exopodite elongated and slender.

Remarks: The present new species is allied to *Nagurus luridus* but the former is separated from the latter in the following features: (1) longer second antenna, (2) longer first saegment of second antenna, (3) concave pleotelson, and (4) round grandular part.

***Nagurus miyakoensis* n. sp.**

(Jap. name: Shirohige-hayashi-warajimushi, new)

Fig. 116

Material examined: 1♂ (holotype, 5.8mm in body length) and 1♀ (allotype, 7.8mm in body length, Painagama-Beach, Hirara City, Miyako-Island, Okinawa Pref., coll. Noboru Nunomura, June 26, 1975; 1♂ (paratype, 8.3mm in body length) and 2♀♀ (paratypes, 8.0～9.

3mm in body length), Shimosato Botanical Garden, Shimosato, Hirara-City, Miyako Island, Okinawa Pref., coll. Hiroshi Hoshikawa. Type series is deposited as follows: holotype

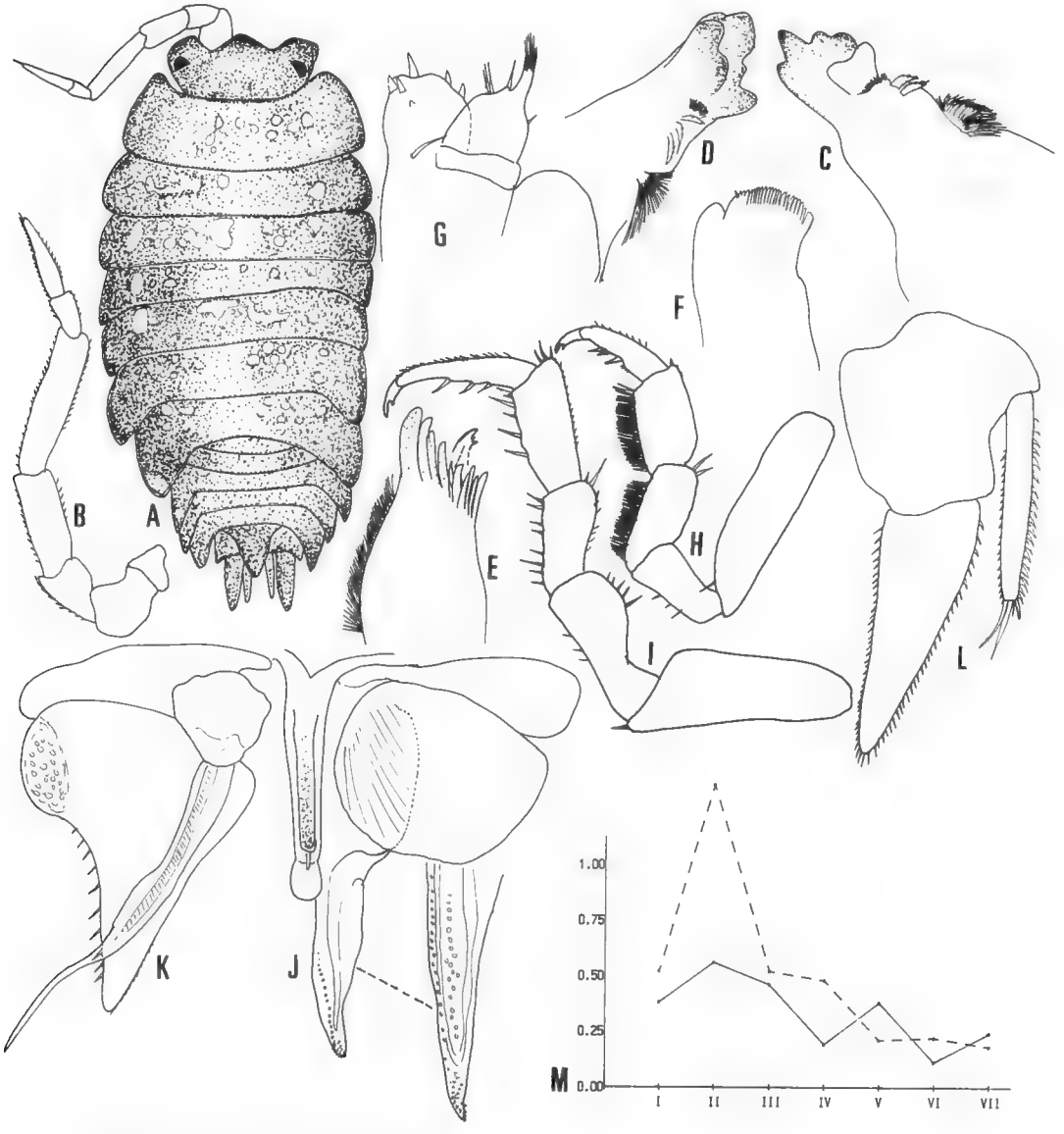

Fig. 116. *Nagurus miyakoensis* n. sp.

A. Dorsal view; B. Second antenna; C. Right mandible; D. Left mandible; E. Outer lobe of first maxilla; F. Second maxilla; G. Maxilliped; H. First peraeopod; I. Seventh peraeopod; J. Penes and male first pleopod; K. Male second pleopod; L. Uropod; M. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All: Holotype male).

(TOYA-Cr-6693), allotype (TOYA-Cr-6694) and 2 paratypes (TOYA-Cr-6695～6696) at the Toyama Science Museum, and a paratype (OMNH-Ar-3082) at the Osaka Museum of Natural History.

Description : Body oval, 1.9 times as long as wide. Body colour brown with paler irregular patterns. Cephalon with a triangular medial process and rectangular lateral lobes. Eyes mediocre in size, each eye composed of about 10 ocelli. All the peraeonal somites subequal in length. All the pleonal somites subequal in length. Pleotelson narrow but elongated. Noduli lateralis on peraeonal somite II is very remote from the lateral margin (Fig. 116 M).

First antenna ; first segment oblong ; second segment relatively short ; terminal segment rectangular with 5 aesthetascs at the tip.

Second antenna (Fig. 116 B), reaching the anterior margin of the third peraeonal somite. Flagellum almost as long as fifth peduncular segment ; second segment 2.3 times as long as the first.

Right mandible (Fig. 116 C) ; pars incisiva 4-headed ; lacinia mobilis single-toothed ; 2 hairy bristles between lacinia mobilis and processus molaris.

Left mandible (Fig. 116 D) ; processus molaris 3～4-headed ; lacinia mobilis 2-headed ; 3 hairy bristles between lacinia mobilis and processus molaris.

First maxilla (Fig. 116 E) ; outer lobe with 10 (4+6) teeth at the tip, two of them are 3-headed type.

Second maxilla (Fig. 116 F) bilobed.

Maxilliped (Fig. 116 G) ; endite with 6 strong spines ; palp rather stout.

Seventh peraeopod (Fig. 116 I) ; basis elongated ; ischium with a sternal margin bearing 5～6 setae ; merus rectangular with 8～9 setae on inner margin and several setae at distal outer corner ; carpus rectangular with 5～7 setae on inner margin and 2～3 setae on outer distal corner ; propodus with 7～8 setae on inner margin.

Penes (Fig. 116J) straight with round tip.

Male first pleopod (Fig. 116 J) ; endopodite almost straight and bears many minute spinules in the distal part ; exopodite almost round, length 1.3 times as long as width.

Male second pleopod (Fig. 116 K) ; endopodite very long ; exopodite triangular with a shallow concavity at distal margin, and 8～9 spines on outer margin.

Uropod (Fig. 116 L) ; basis almost square ; endopodite narrow ; exopodite stout, slightly longer than endopodite.

Remarks : In gross, resembling *Porcellio solfigus* IWAMOTO described from Atami and other localities, the present new species is considered in fact to belong the genus *Nagurus*, by the shape of exopodite of male first pleopod. The former is easily separed from the latter in the following features : (1) shape of cehalon, (2) lack of hump-shaped structure on cephalon, and (3) white second antenna.

Nagurus lineatus n. sp.

(Jap. name : Tatesuji-hayashi-warajimushi, new)

Fig. 117

Material examined : 2♀♀ (1♀ holotype, 4.6mm in body length and 1♀ paratype, 5.8mm in body length), Kiyose, Chichijima Island, Bonin Islands, coll. Jun-ichi Aoki, July 2, 1977 ; and 1♀ (paratype, 4.9mm in body length), from the same locality, coll. Jun-ichi, Aoki, June 21, 1977. Type series is deposited as follows : holotype (TOYA-Cr-6681), and a paratype (TOYA-Cr-6682) at the Toyama Science Museum and a paratype (OMNH-Ar-3097) at the Osaka Museum of Natural Hisotry.

Description : Body oval, 2.2 times as long as wide. Body colour dull yellow with 4 lines of darker patterns. Body surface weakly granulated. Eyes moderate in size, each eye composed of about 15 ocelli. Cephalon with a round medial projection and rectangular lateral projections. Pleotelson triangular, sides with a concavity. Noduli lateralis on peraeonal somites II-IV somewhat remote (Fig. 117K).

First antenna (Fig. 117 B) ; first segment big and stout ; second segment short ; terminal segment rectangular with 4 aesthetascs at the tip.

Second antenna (Fig. 117 C), reaching second peraeonal somite, first to third peduncular segments short and white in colour ; fourth peduncular segment to the tip blackish in colour. Flagellum 80% as long as the pedunclular segment ; second flagellar segment 3 times as long as the first.

Right mandible (Fig. 117 D) ; pars incisiva weakly 4-headed ; lacinia mobilis single-toothed ; 2～3 hairy bristles between lacinia mobilis and processus molaris.

Left mandible (Fig. 117 E) ; pars incisiva 3～4 headed ; lacinia mobilis weakly 3～4-headed ; 4 hairy bristles between and processus molaris.

First maxilla (Fig. 117 F) ; outer lobe with 10 (4+6) etire teeth.

Second maxilla bilobed.

Maxilliped (Fig. 117 G) ; endite with 5 spurs and a strong teeth.

First peraeopod (Fig. 117 H) ; basis oblong ; ischium rectangular ; merus rectangular with 6～7 setae on inner margin ; carpus 9～10 long setae ; propous with 2 long setae and a series of fine hair on inner margin.

Seventh peraeopod (Fig. 117 I) ; basis oblong ; ischium with a sternal margin ; merus rectangular ; carpus rectangular with 6～7 setae on inner margin ; propodus relatively short with 5 setae on inner margin.

Uropod (Fig. 117 L) ; basis pentagonal ; endopodite lanceolate ; exopodite lanceolate, 1.5 times as long as endopodite.

Remarks : Although no male specimen has been collected, this species is considered to be new in the genus *Nagurus* in the following featurs : (1) it is only one species that has round first peraeonal somite but relatively long first flagellar segment and (2) peculiar colouration of second antenna ; basal 3 segments of which are pigmentless.

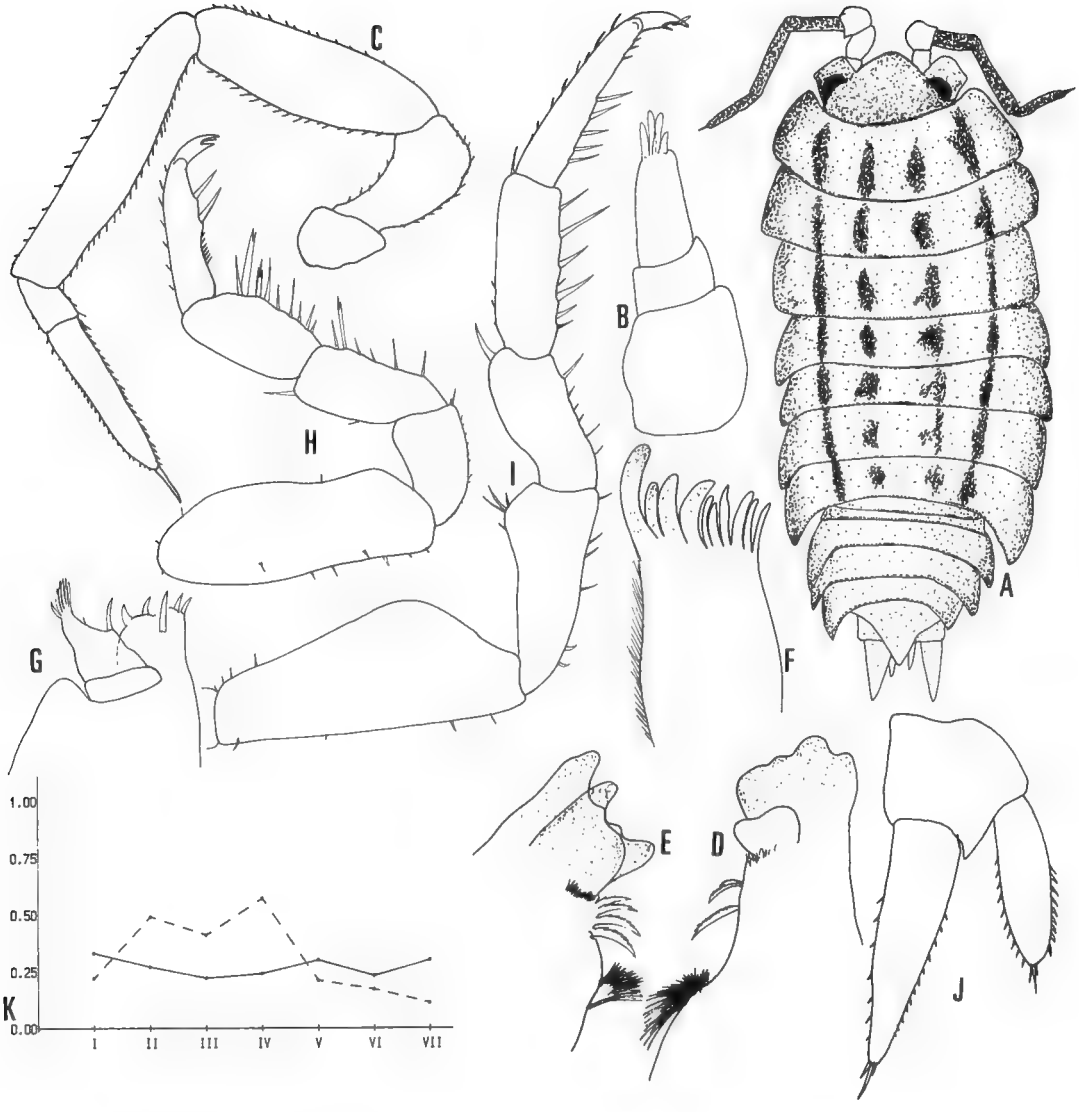

Fig. 117. *Nagurus lineatus* n. sp.

A. Dorsal view ; B. First antenna ; C. Second antenna ; D. Right mandible ; E. Left mandible ; F. Outer lobe of first maxilla ; G. Maxilliped ; H. First peraeopod ; I. Seventh peraeopod ; J. Uropod ; K. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All : Holotype female).

Nagurus sp.

Fig. 118

Material examined: 1♀, 6.1mm in body length, Iriomote-Island, Okinawa Pref., coll. Hiroyuki Watanabe, Aug. 5, 1983.

Description: Body 2.2 times as long as wide. Body colour white except black eyes. Body surface smooth. Cephalon round; medial process triangular and rather low; lateral angles round. Eyes rather small, each eye composed of about 10 ocelli. All the peraeonal somites subequal in length; all the peraeonal somites are round at the posterolateral part. Each pleonal somite subequal in length. Pleotelson triangular but longerthan wide. Uropod short; basis longer than wide; endopodite short; exopodite short but short. Noduli lateralis indistinct.

Second antenna (Fig. 118 B) relatively short, reaching the middle part of the first peraeonal somite, mutual lenght of 5 peduncular segments is 2 : 5 : 5 : 7 : 9. Flagellum a little shorter than the fifth peduncular segment second segment is about twice as long as the first.

Right mandible (Fig. 118 C); pars incisiva 2-headed; lacinia mobilis single-toothed; 4 hairy bristles between lacinia mobilis and processus molaris.

Left mandible (Fig. 118 D); pars incisiva 2-headed; lacinia mobilis single-toothed; 3 hairy bristles between lacinia mobilis and processus molaris.

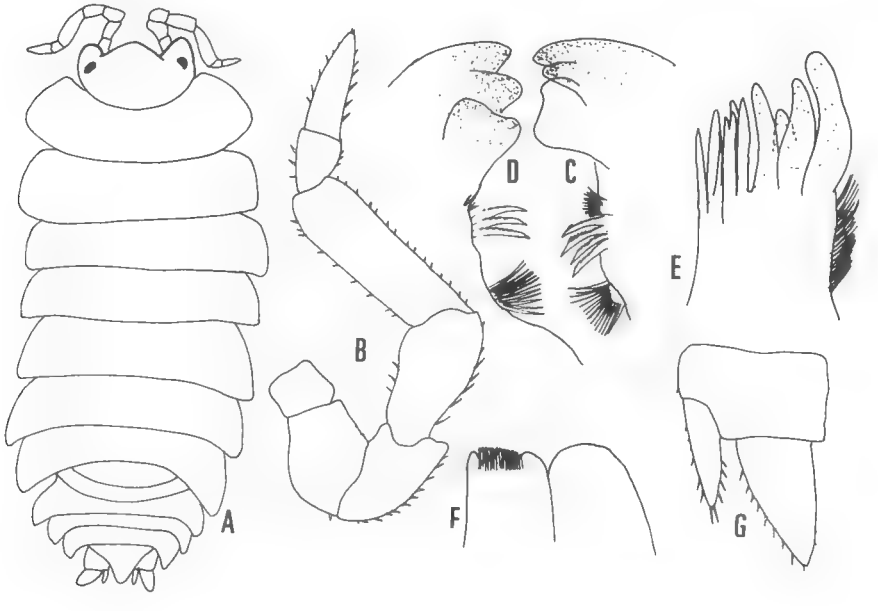

Fig. 118. *Nagurus* sp.

A. Dorsal view; B. Second antenna; C. Right mandible; D. Left mandible; E. Outer lobe of first maxilla; F. Second maxilla; G. Uropod (All: Female from Iriomote Island).

First maxilla (Fig. 118 E) ; outer lobe with 10 (4+6) teeth at the tip, one of them is cleft type.

Second maxilla (Fig. 118 F) bilobed.

Uropod (Fig. 118 G) short ; basis longer than wide ; endopodite short ; exopodite stout but short.

Remarks : As only one broken female specimen was available to me, specific determination was imopossible.

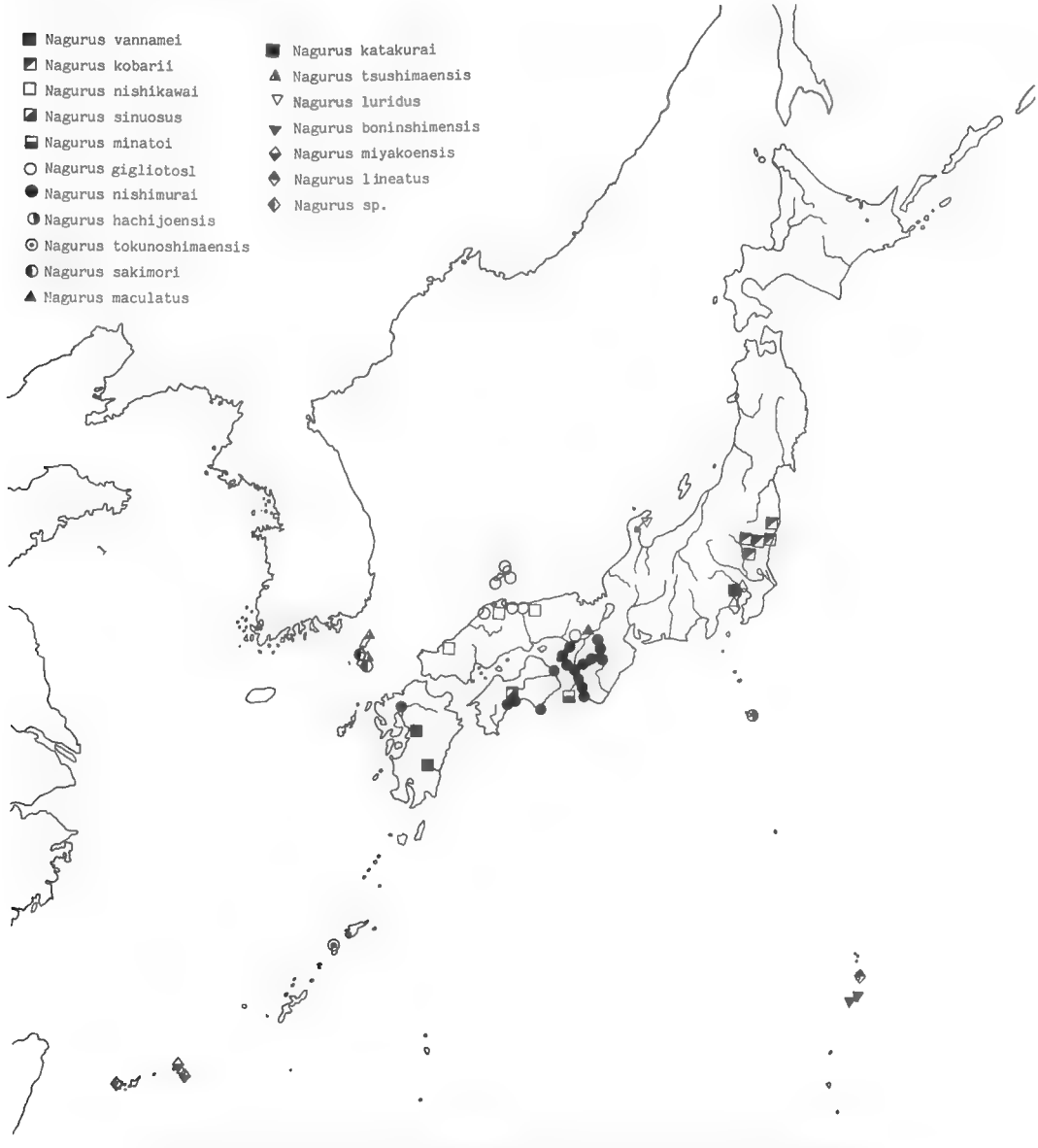

Fig. 119. Map showing the geographical distribution of the genus *Nagurus*.

Genus *Protracheoniscus* VERHOEFF, 1917

(Jap. name : Sato-warajimushi-zoku, new)

Trachelipidae with *Porcellio*-type pseudotracheae on all the pleopods ; Second antenna with 2-segmented flagellum. Cephalon *Porcellionides*-like, no pronounced medial and lateral lobes. First peraeonal somite with rounded margin. Pleotelson wider than long. Unable to conglobate ; tergite without tubercles.

Key to the Japanese species of the Genus *Protracheoniscus*.

1 Terminal flagellar segment of second antenna less than 2.5 times as long as the first segment. Body relatively big, adult exceeds 8mm in length 2

1' Terminal flagellar segment of second antenna exceeds more than 2.8 times as long as first segment. Body small, less than 6mm in length 4

2 Noduli lateralis on all the peraeonal somites near to the lateral margin. Body less than 2.1 times as long as wide. First antenna with less than 5 aesthetascs at the tip 3

2' Noduli lateralis on the peraeonal somites I, II and VII remote from the lateral margin. Body more than 2.2 times as long as wide. First antenna with 6 aesthetascs at the tip .....*P. tangoensis* n. sp.

3 First segment of the second antenna 2.2 times than the first. Exopodite of male first pleopod with a very deep concavity .....*P. nipponicus* ARCANGELI

3' First segment of the second antenna less 1.6 times as long as the terminal segment. Exopodite of male first pleopod without deep concavity .....*P. satsumaensis* n. sp.

4 Second antenna relatively long and reaches the second peraeonal somite. Exopodite of male first pleopod round, without any concavity. Pleotelson relatively long 5

4' Second antenna short, only reaches the first peraeonal somite. Exopodite with at least shallow concavity. Pleotelson short, about half the length of the width .....*P. awaensis* n. sp.

5 Tip of pleotelson pointed. First antenna with less than 5 aesthetascs at the tip 6

5' Tip of pleotelson rounded. First antenna with 8 aesthetascs at the tip .....*P. circacaudatus* n. sp.

6 Noduli lateralis on peraeonal somites II, III and VII relatively remote from the lateral margin. Exopodite of male first pleopod at least remarkable concavity. Body usually irregular or longitudinal patterns 7

6' Noduli lateralis on all the peraeonal somites near to the lateral margin. Exopodite of male first pleopod with sinuate outer margin but without any distinct concavity on outer margin. Body usually with speckled patterns .....*P. pannuosus* n. sp.

7 Eyes relatively small. Flagellum with 5 aesthetascs at the tip. Merus and carpus of male first peraeopod with sparse setae on inner margin .....*P. masahitoi* n. sp.

7' Eyes relatively large. Flagellum with 4 aesthetascus at the tip. Merus and carpus of male first peraeopod with dense long setae on inner margin .....*P. hokurikuensis* n. sp.

Protracheoniscus nipponicus ARCANGELI, 1952

(Jap. name : Yamato-sato-warajimushi, new)

Fig. 120

Porcellio (Nagara) sundaicus DOLLFUSS ; ———— ARCANGELI, 1927.

Protracheoniscus nipponicus ARCANGELI, 1952

Material examined : 1 ♂ 12 ♀♀, Botanical Garden of the Kyoto University, Kitashirakawa-oiwake-chô, Sakyô-ku, Kyoto City, Kyoto Pref. coll. Noboru Nunomura, May 6, 1975 ; 3♂♂ 3♀♀, Nagai Park, Higashisumiyoshi-ku, Osaka City, Osaka Pref. coll. Noboru Nunomura, 2♂♂ 2♀♀, Harumi-dai, Sakai City, Osaka Pref., coll. Keitarô Harusawa, July 25, 1983 ; 6♀♀, Shiga-chô., Shiga Pref., coll. Hiroyuki Watanabe, May 30, 1978 ; 1♂, Kinsenji, Toyama City, Toyama Pref., coll. Noboru Nunomura, May, 1976.

Description : Body oval lanceolate, 1.8 times as long as wide. Body length reaches 10.0mm in female collected from Kyoto. Body blackish with a pair of lateral paler patterns and irregular paler patterns on the medial part of peraeon. Cephalon rather short ; medial process rather short ; lateral projections rectangular. Eyes mediocre in size, each eye composed of 24 ocelli. Each peraeonal somite subequal in length. Each pleonal somite subequal in length ; posterolateral angles of pleonal somites I-III protruded posteriorly. Pleotelson almost right-angled and somewhat round. Noduli lateralis on all the peraeonal somites not so remote from the lateral margin (Fig. 120 L).

First antenna (Fig. 120 B) composed of 3 segments ; first segment rectangular ; second segment short ; terminal segment rectangular with 6～7 short aesthetascs at the distal margin.

Second antenna (Fig. 120 C), reaching the anterior part of the second peraeonal somite, mutual length of 5 peduncular segments is 2 : 5 : 5 : 7 : 11. Flagellum 90% length of the fifth peduncular segment ; second segment 2.3 times as long as the first.

Right mandible (Fig. 120 D) ; pars incisiva 3-headed ; lacinia mobilis not chitinized and composed of a single tooth ; 6～7 hairy bristles behind lacinia mobilis ; processus molaris is represented by a tuft of many hairy bristles.

Left mandible ; pars incisiva 2-headed ; lacinia mobilis 2-headed ; 4-hairy bristles between lacinia mobilis and processus molaris.

First maxilla ; outer lobe with 10 (4+6) teeth at the tip.

Second maxilla bilobed.

Maxilliped (Fig. 120 E) ; endite rectangular with 2 stout spines and a narrow setae on the distal margin.

First peraeopod (Fig. 120 F) shorter than other peraeopods ; basis oblong with 10～12 minute setae on inner margin ; ischium rectangular ; merus and carpus rectangular with many setae on inner margin ; propodus relatively short.

Seventh peraeopod (Fig. 120 H) ; basis big and rectangular ; ischium with a series of setae on inner margin and 4～5 long setae on outer margin merus rectangular with 10 short setae

on inner margin and 2 long setae at outerdistal corner ; carpus with swollen outer part and 9～10 setae on inner margin and 3～4 setae at outer distal corner ; propodus with 3～4 setae and many fine hair on inner margin.

Penes (Fig. 120 I) rather robust, tip is truncated.

Male first pleopod (Fig. 120 I) ; exopodite almost rectangular with a round concavity on

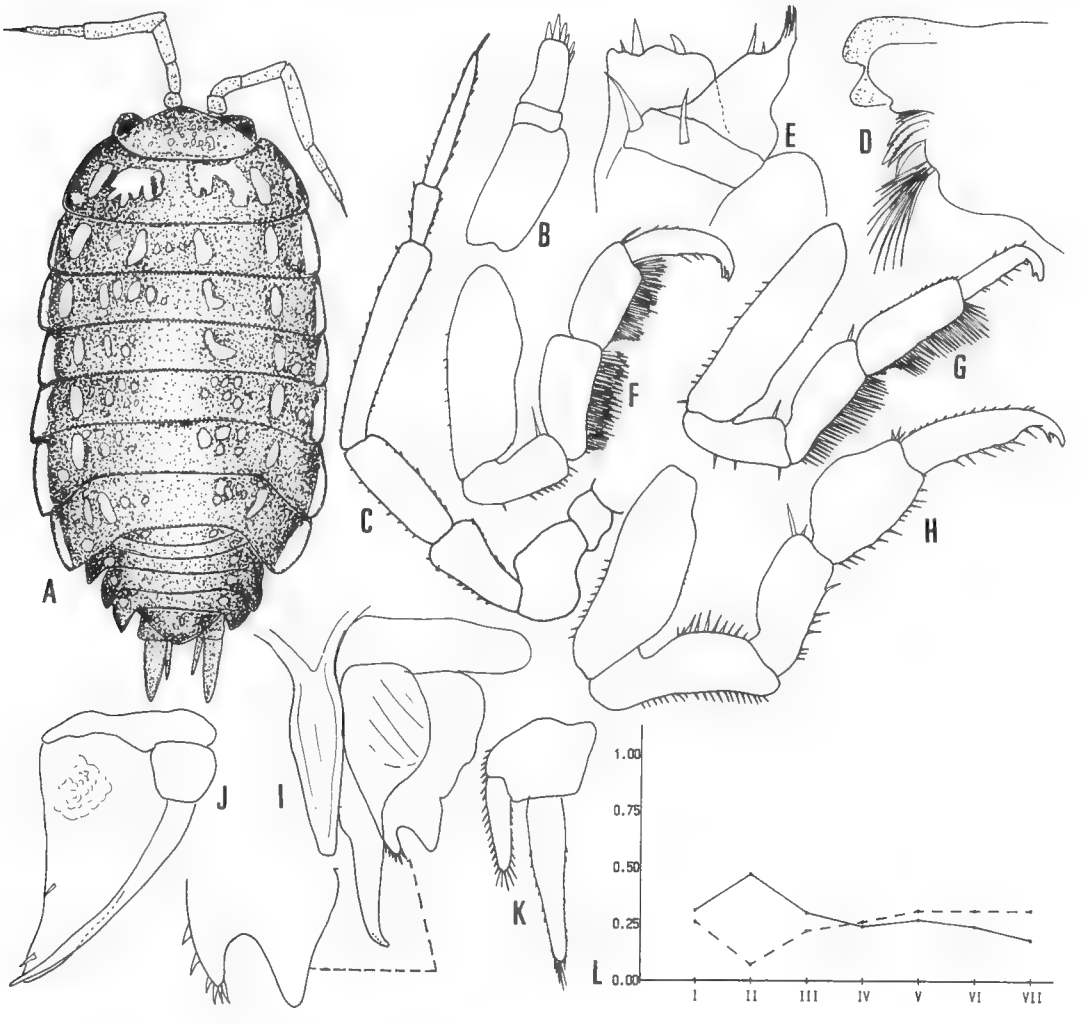

Fig. 120. *Protracheoniscus nipponicus* ARCANGELI, 1952

A. Dorsal view ; B. First antenna ; C. Second antenna ; D. Right mandible ; E. Maxilliped ; F. First peraeopod ; G. Second peraeopod ; H. Seventh peraeopod ; I. Penes and male first pleopod ; J. Male second pleopod ; K. Uropod ; L. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All : Male specimens collected at Kyoto).

the outer margin and bears 5 spines at the inner distal part ; endopodite almost straight with a small concavity at the tip.

Male second pleopod (Fig. 120 J) ; exopodite elongated triangular ; endopodite straight and slender.

Uropod (Fig. 120 K) ; basis trapeozoidal ; endopodite narrow ; exopodite also narrow, about twice as long as the endopodite.

Remarks : In some important features, the specimens at my disposal agrees with the original description of *Protracheoniscus nippoinicus,* which was first ascribed to as an Indonesian species, *Porcellio sundaicus*. The description given above contains many features which were first remarked.

***Protracheoniscus masahitoi* n. sp.**

(Jap. name : Masahito-sato-warajimushi, new)

Fig. 121

Material examined : 2♂♂ (1♂ holoytpe, 4.5mm in body length and 1♂ paratype) and 6♀♀ (1♀ allotype, 4.4mm in body length, 5♀♀ paratypes), Fukiage-gyoen, the garden of the Imperial Palace, Chiyoda-ku, Tokyo, coll. Prince Masahito ; 1♂ 6♀♀, Takatori-yama, Yokosuka City, Kanagawa Pref., coll. Jun-ichi Aoki and Hiroshi Harada, Dec. 16, 1983. Type series is deposited as follows : holotype (TOYA-Cr-7003), allotype (TOYA-Cr-7004) and 2 paratypes (TOYA-Cr-7005～7006) at the Toyama Science Museum, a paratype (OMNH-Ar-3104) at the Osaka Museum of Natural History, a paratype (YCM-CI-947) at the Yokosuka City Museum, and 2 paratypes (NSMT-Cr-9354) at the National Science Museum, Tokyo.

Description : Body oval-lanceolate, 2.4 times as long as wide. Body colour brown with paler patterns. Body surface relatively granulated. Cephalon with small and round lateral lobes and a low medial process. Eyes relatively small, each eye with 15 ocelli. Each peraeonal somite subequal in length. Pleotelson triangular, side without remarkable concavity. Noduli lateralis on the peraeonal somites II, III and VII are relatively remote from the lateral margin (Fig. 123 N).

First antenna (Fig. 121 B) ; first segment rectangular ; second segment short ; third segment rectangular with 5 aesthetascs at the tip.

Second antenna (Fig. 121 C) ; reaching the anterior part of second peraeonal somite. Flagellum almost as long as the fifth peduncular segment ; second flagellar segment 3.1 times as long as the first.

Right mandible (Fig. 121 D) ; pars incisiva 3-headed ; lacinia mobilis single-toothed ; 4 hairy bristles between lacinia mobilis and processus molaris.

Left mandible (Fig. 121 E) ; pars incisiva 3-headed ; lacinia mobilis single-toothed ; 3～4 hairy brisltes between lacinia mobilis and processus molaris.

First maxilla (Fig. 121 F) ; outer lobe 10 (4+6) entire teeth.

Second maxilla (Fig. 121 G) ; bilobed, dental part narrow.

Maxilliped (Fig. 121 H) ; endite round with 3 spines and a stong tooth, palp slender.

First peraeopod (Fig. 121 I) ; basis oblong ; ischium rectangular with 3 setae on inner margin ; merus rectangular with 12~13 setae on inner margin ; carpus rectangular with 6-7 setae on inner margin propodus short with 4 setae on inner margin.

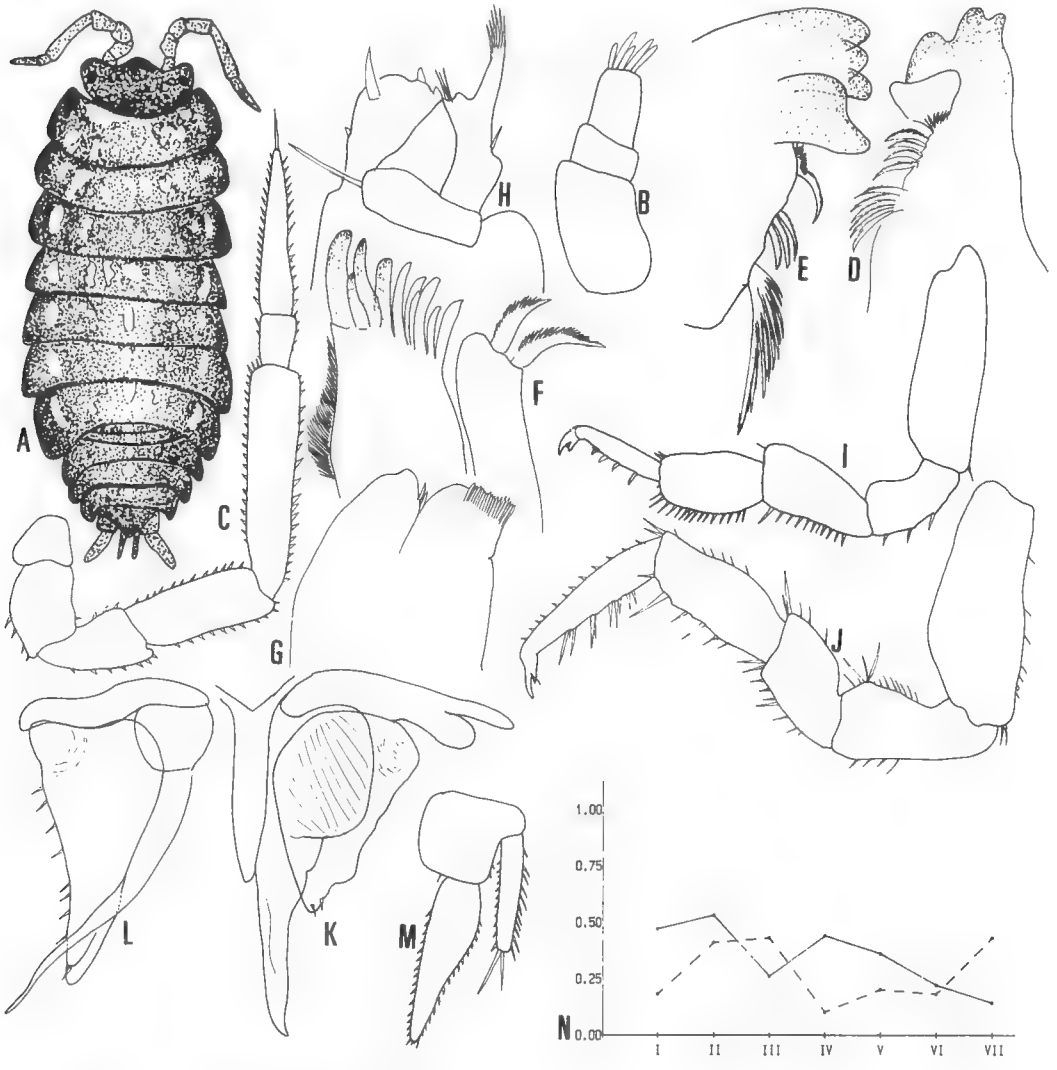

Fig. 121. *Protracheoniscus masahitoi* n. sp.

A. Dorsal view ; B. First antenna ; C. Second antenna ; D. Right mandible ; E. Left mandible ; F. First maxilla ; G. Second maxilla ; H. Maxilliped ; I. First peraeopod ; J. Seventh peraeopod ; K. Penes and male first pleopod ; L. Male second pleopod ; M. Uropod ; N. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All : Holotype male).

Seventh peraeopod (Fig. 121 J); basis rectangular; ischium elongated with a low sternal margin bearing a few of seta; merus short; carpus 1.6 times as long as merus, bearing 6～7 setae on inner margin; propodus long with 8～9 setae on inner margin.

Penes (Fig. 121 K) broad and linear.

Male first pleopod (Fig. 121 K); endopodite relatively short and straight; exopodite elliptical with slightly sinuate outer margin, 2 spinules near the distal tip.

Male second pleopod (Fig. 121 L); endopodite long and exceeding beyond the exopodite; exopodite triangular and long with 9～10 spines on outer margin.

Uropod (Fig. 123 M); basis almost square; endopodite linear; exopodite slightly longer than endopodite.

Remarks: The present new species is separable from *Protracheoniscus nipponicus* in the following features: (1) exopodite of male first pleopod without distinct concavity, (2) terminal flagellar segment of second antenna exceeds more than 3 times as long as the first, (3) remote posiotion of noduli lateralis on the peraeonal somites II, III and VII, and (4) smaller body size.

***Protracheoniscus tangoensis* n. sp.**

(Jap. name: Tango-sato-warajimushi, new)

Fig. 122

Material examined: 3♂♂ (1♂ holotype, 7.4mm in body length and 2♂♂ paratypes, 8.5～9.3mm in body length and 4♀♀ (1♀ allotype, 10.1mm in body length and 3♀♀, paratypes 5.5～8.0mm in body length, Ômiya-chô, Naka-gun, Kyoto Pref., coll. Hisao Nambu, Dec. 26, 1982. Type series is deposited as follows: holotype (TOYA-Cr-6745), allotype (TOYA-Cr-6746) and 3 paratypes (TOYA-Cr-6747～6748) at the Toyama Science Museum, 2 paratypes (OMNH-Ar-3094～3095) at the Osaka Museum of Natural History, and a paratype (NSMT-Cr-9349) at the National Science Museum, Tokyo.

Description: Body, oval-lanceolate, 2.3 times as long as wide. Body colour brown with a pair of lateral paler patterns and irregular paler patterns. Body surface smooth. Cephalon round with a very low medial process, lateral lobes small. Eyes big, each eye composed of 24 ocelli. All the peraeonal somites subequal in length. Posterolateral corner of first peraeonal somite round. Pleotelson triangular, sides straight. Noduli lateralis are as Fig. 122 M.

First antenna (Fig. 122 B); first and second segments square; third segment rectangular with 6 aesthetascs at the tip.

Second antenna (Fig. 122 C), reaching the anterioir part of the second peraeonal somites, mutual length of 5 peduncular segments is 2 : 3 : 3 : 6 : 9. Flagellum somewhat shorter than the fifth peduncular segment; second segment about twice as long as the second.

Right mandible (Fig. 122 D); pars incisiva 3-headed; lacinia mobilis single-toothed; 3 hairy bristles between lacinia mobilis and processus molaris.

Left mandible (Fig. 122 E); pars incisiva 2-headed lacinia mobilis 2-headed; 4 hairy

bristles between lacinia mobilis and processus molaris.

First maxilla (Fig. 122 F); outer lobe with 10 (4+6) entire teeth at the tip.

Second maxilla (Fig. 122 G) bilobed, dental area wide.

Maxilliped; endite wide with 2 spines and a strong seta.

First to third peraeopods (Fig. 122 H); basis oblong; ischium rectangular with a seta on outer margin; merus and carpus rectangular with many setae on inner margin; propodus rather short.

Seventh peraeopod (Fig. 122 I); basis oblong; ischium rectangular with a low of sternal

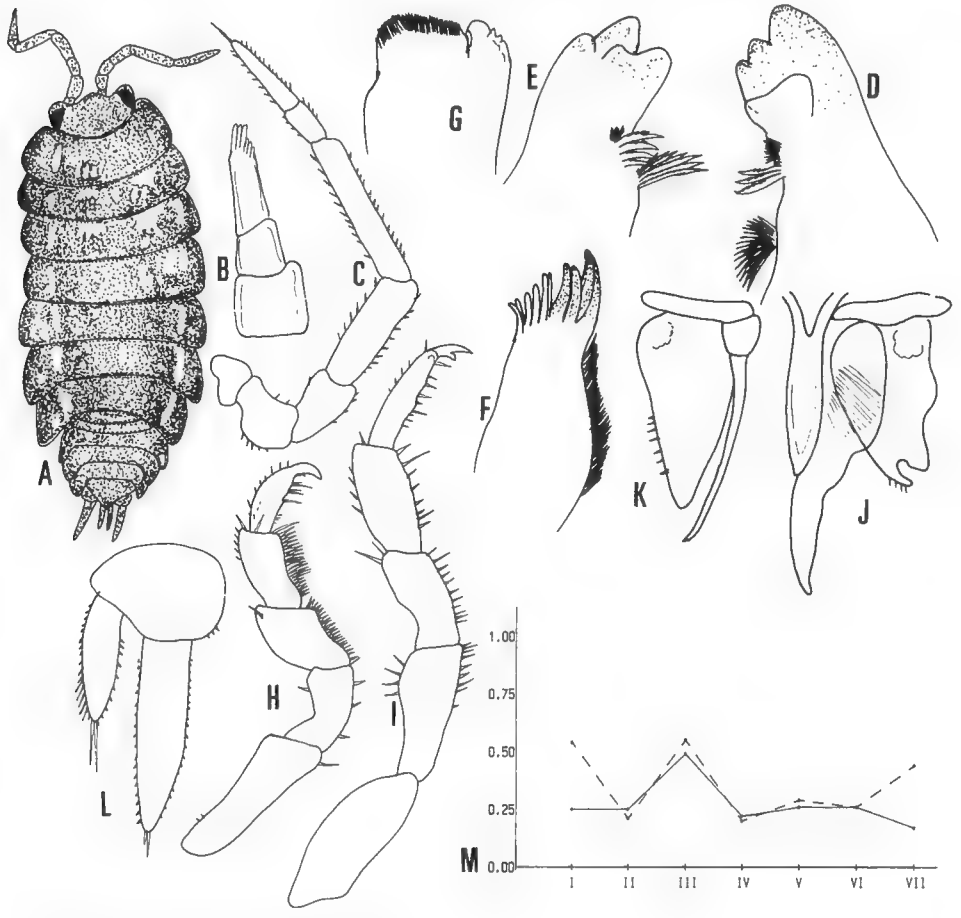

Fig. 122. *Protracheoniscus tangoensis* n. sp.

A. Dorsal view; B. First antenna; C. Second antenna; D. Right mandible; E. Left mandible; F. Outer lobe of first maxilla; G. Second maxilla; H. First peraeopod; I. Seventh peraeopod; J. Penes and male first pleopod; K. Male second pleopod; L. Uropod.; M. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All: Holotype male).

margin bearing 4 setae ; merus and carpus rectangular with 8～12 setae on inner, margin ; propodus rather long with 10 setae on inner margin.

Penes (Fig. 122 J) fusiform.

Male first pleopod (Fig. 122 J) ; endopodite straight and tapering towards the tip and the apical part bent outerwards ; exopodite almost rectangular with a deep very concavity at the tip and 4 small denticles on inner distal margin.

Male second pleopod (Fig. 122 K) ; endopodite straight, slightly exceeds the exopodite ; exopodite elongated triangular with 7 denticles on the diatal half of outer margin.

Uropod (Fig. 122 L) ; basis round ; endopodite short but stout with 2～3 long setae at the tip and many spines and setae around the margin ; exopodite 1.5 times as long as the endopodite.

Remarks : The present new species is allied to *Protracheoniscus nipponicus* but the former is separated from the latter in the following features : (1) slenderer body shape, (2) remote position of noduli lateralis on peraeonal somites I, III and VII, (3) more numerous aesthetascs at the tip of first antenna, (4) long second segment of first antenna, (5) bigger eyes, and (6) lack of swollen part on carpus on male seventh peraeopod.

***Protracheoniscus satsumaensis* n. sp.**

(Jap. name : Satsuma-sato-warajimushi, new)

Fig. 123

Material examined : 1♂ (holotype 8.0mm in body length 6♀♀ (1♀ allotype 10.5mm in body length and 5♀♀ paratytpes, 8.2～10.4mm in body length), Shigetomi, Aira-chô, Aira-gun, Kagoshima Pref., coll. Noboru Nunomura, July 2, 1981 ; 1♂ 3♀♀, Kohama, Ibusuki City, Kagoshima Pref., coll. Minako Terada, Mar. 26, 1980 ; 1♂, Matsunami-chô, Higashi-karatsu, Karatsu City, Saga Pref., coll. Noboru Nunomura, Sep. 24, 1983. Type series is deposited as follows : Holotype (TOYA-Cr-6801), allotype (TOYA-Cr-6802) and 2 paratypes (TOYA-Cr-6803～6804) at the Toyama Science Museum, a paratype (OMNH-Ar-3103) at the Osaka Museum of Natural History and a paratype (NSMT-Cr-9353) at the National Science Museum, Tokyo.

Description : Body oval lanceolate, 2.1 times as long as wide. Body colour black with paler irregular patterns and a pair of longitudinal patterns. Body surface smooth. Cephalon with a pair of poorly developed lateral lobes and a low triangular medial process. Eyes big, each eye composed of 24～25 ocelli. Each peraeonal somite subequal in length. All the pleonal somites subequal in length. Posterolateral margin of first peraeonal somite round. Pleotelson triangular but relatively short, sides only slightly concave. All the noduli lateralis not so remote from the lateral margin (Fig. 123 M).

First antenna (Fig. 123 B) ; first segment broad ; second segment square ; terminal segment rectangular with 4～5 aesthetascs.

Second antenna (Fig. 123 C), reaching the anterior margin of the second peraeonal

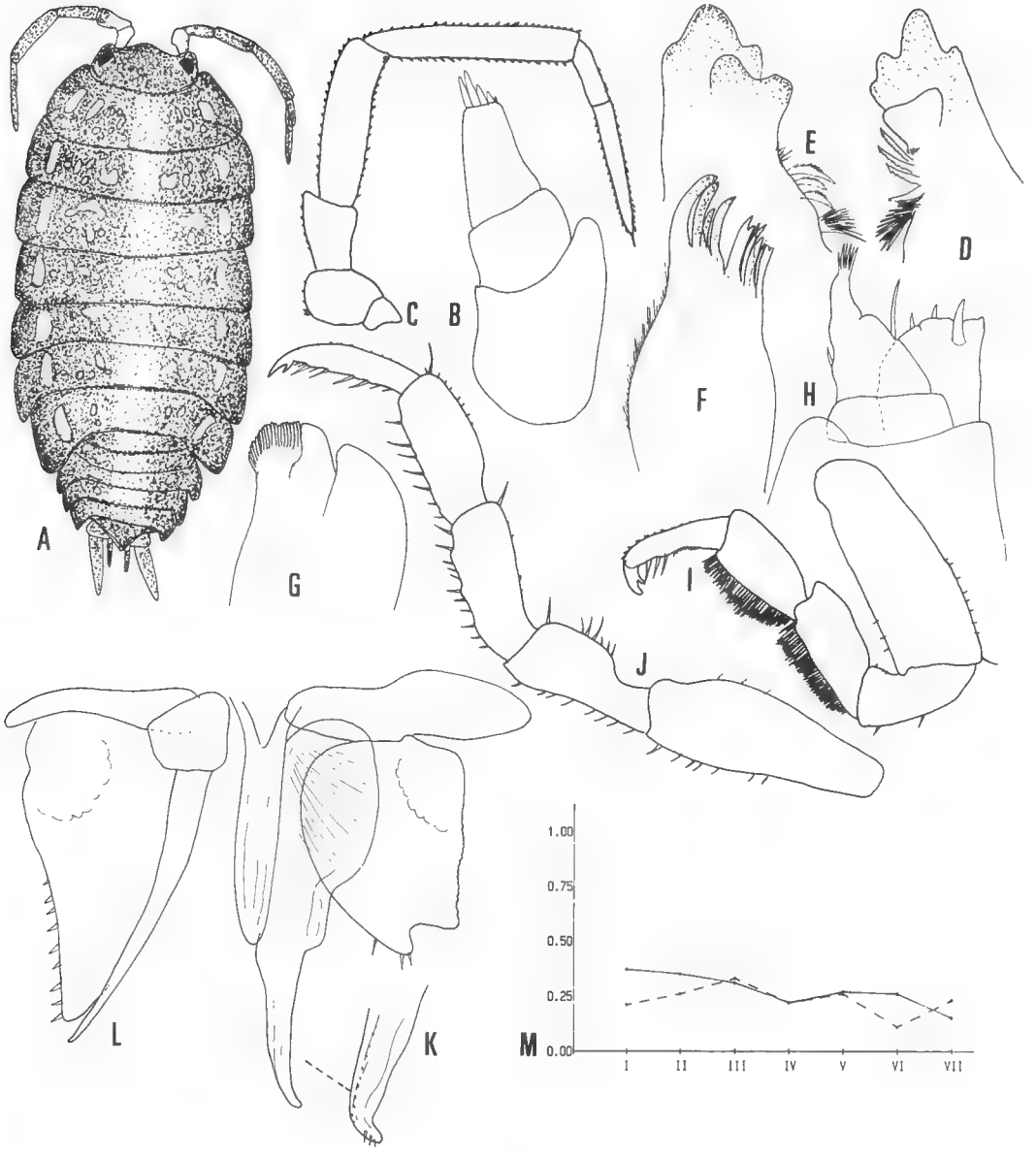

Fig. 123. *Protracheoniscus satsumaensis* n. sp.

A. Dorsal view ; B. First antenna ; C. Second antenna ; D. Right mandible ; E. Left mandible ; F. Outer lobe of first maxilla ; G. Second maxilla ; H. Maxilliped ; I. First peraeopod ; J. Seventh peraeopod ; K. Penes and male first pleopod ; L. Male second pleopod ; M. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All : Holotype male).

somite. Flagellum 1.2 times as long as the fifth peduncular segment; second segment 1.6 times as long as the first.

Right mandible (Fig. 123 D); pars incisiva 3～4 headed; lacinia mobilis single-toothed with a very shallow concavity; 4 hairy bristles between lacinia mobilis and processus molaris.

Left mandible (Fig. 123 E); pars incisiva 3-headed; lacinia mobilis 2～3-headed; 4 hairy bristles between lacinia mobilis and processus molaris.

First maxilla (Fig. 123 F); outer lobe with 10 (4+6) teeth, 2 of them are bifid.

Second maxilla (Fig. 123 H) bilobed; dental part relatively narrow.

Maxilliped (Fig. 123 G); endite with 3 spines; palp slender.

First peraeopod (Fig. 123 I); basis rectangular; ischium rectangular; merus and carpus rectangular with many setae on inner margin; propodus relatively short with 3 long setae on inner distal margin.

Seventh peraeopod (Fig. 123 J); basis oblong; ischium rectangular without strong sternal margin; merus and carpus rectangular and equal in length; propodus relatively short with 7 setae on inner margin.

Penes (Fig. 123 K) lanceolate.

Male first pleopod (Fig. 123 K); endopodite narrow and its apical part bent outwards slightly; exopodite ovate with a relatively deep concavity at the tip and 4～5 spines on inner margin.

Male second pleopod (Fig. 123 L); endopodite slender; exopodite triangular with 9～10 denticles on outer margin.

Uropod; basis rectangular; endopodite narrow with many setae on inner and distal margins; exopodite 1.7 times as long as endopodite.

Remarks: The present new species is allied to *Protracheoniscus nipponicus* but the former is separated from the latter in the following features: (1) relatively short terminal flagellar segment, (2) relatively long second segment of first antenna, and (3) lack of swollen part on carpus of male seventh peraeopod.

***Protracheoniscus hokurikuensis* n. sp.**

(Jap. name: Hokuriku-sato-warajimushi, new)

Fig. 124

Material examined: 3♂♂ (1♂ holotype, 5.6mm in body length and 2♂♂, paratypes 4.5～4.8mm in body length) and 12♀♀ (1♀ allotype, 5.5mm in body length and 11♀♀ paratypes, 4.2～5.7mm in body length), Ogi, Uchiura-chô, Suzu-gun, Isihikawa Pref., coll. Noboru Nunomura, June 12, 1979; 1♂ 2♀♀, Horikawakoizumi, Toyama City, Toyama Pref. coll. Noboru Nunomura, 1♂♂ 2♀♀, Miyano-yama, Kurobe City, Toyama Pref. coll. Noboru Nunomura Mar. 14, 1987. Type series is deposited as follows: holotype (TOYA-Cr-6793), allotype (TOYA-Cr-6794) and 6 paratypes (TOYA-Cr-6795～6800) at the Toyama Science

Museum, 3 paratypes (OMNH-Ar-3100～3102) at the Osaka Museum of Natural History, 2 paratypes (YCM-CI-945～946) at the Yokosuka City Museum, and 2 paratypes (NSMT-Cr-9352) at the National Science Museum, Tokyo.

Description : Body lanceolate, 2.4 times as long as wide. Body colour pale yellow with 2 rows of longitudinal brown lines. Body surface smooth. Cephalon short ; medial process round and short ; lateral lobes small and round. Eyes large, each eye with 15～16 ocelli. Each peraeonal somite subequal in length. All the peraeonal somites without any concavity on the posterior margin. Pleotelson triangular, sides only slightly concave. Noduli lateralis are as Fig. 126 L.

First antenna (Fig. 124 B) ; first and second segments almost square, terminal segment rectangular with 4 aesthetascs at the tip.

Second antenna (Fig. 124 C), reaching the middle part of the second peraeonal somite, mutual length of second to fifth peduncular segment is 4 : 5 : 8 : 13. Flagellum about 85% as long as the fifth peduncular segment ; second flagellar segment is 3.5 times as long as the first.

Right mandible (Fig. 124 D) ; pars incisiva 4-headed ; lacinia mobilis 2-headed ; 4 hairy bristles between lacinia mobilis and processus molaris.

Left mandible (Fig. 124 E) ; pars incisiva weakly 3-headed ; lacinia mobilis 3-headed ; 4 hairy bristles between lacinia mobilis and processus molaris.

First maxilla ; outer lobe with 10 (4+6) teeth at the tip, all of them entire type.

Second maxilla bilobed and relatively narrow.

Maxilliped (Fig. 124 F) ; endite rectangular 2～3 strong spines and a seta ; palp rather stout.

First peraeopod (Fig. 124 G) ; basis oblong ; ischium rectangular with a seta on outer margin and 4～5 sparse small setae on inner margin ; merus slightly longer than ischium, with 15～16 setae on inner margin ; carpus with many long setae on inner margin ; propodus short.

Seventh peraeopod (Fig. 124 H) ; basis stout ; ischium without a sternal margin ; merus rectangular with about 12 setae on inner margin ; carpus slightly longer than merus and with 8～9 setae on inner margin ; propodus long with 6 long setae on inner margin.

Penes (Fig. 124 I) fusiform.

Male first pleopod (Fig. 124 I) ; endopodite, relatively short and recurved only slightly outwards, bears a small process on the outer margin near the middle part and 2 denticles at the distal part ; exopodite rectangular, with a small concavity and a denticle at the distal margin.

Male second pleopod (Fig. 124 J) ; endopodite long and straight ; exopodite long with 7～12 denticles on the outer margin and a seires of fine hair on inner margin of distal half.

Uropod (Fig. 124 K) ; basis rectangule wider than long ; endopodite narrow with many spines ; exopodite stout but only 1.3 times as long as endopodite.

Remarks : The present new species is most closely allied to *Protracheoniscus masahitoi* already described in this paper, but the former is separated from the latter in the following

features: (1) bigger eyes, (2) less numerous aesthetascs at the tip of first antenna, and (3) presence of dense setae on merus and carpus of first peraeopod.

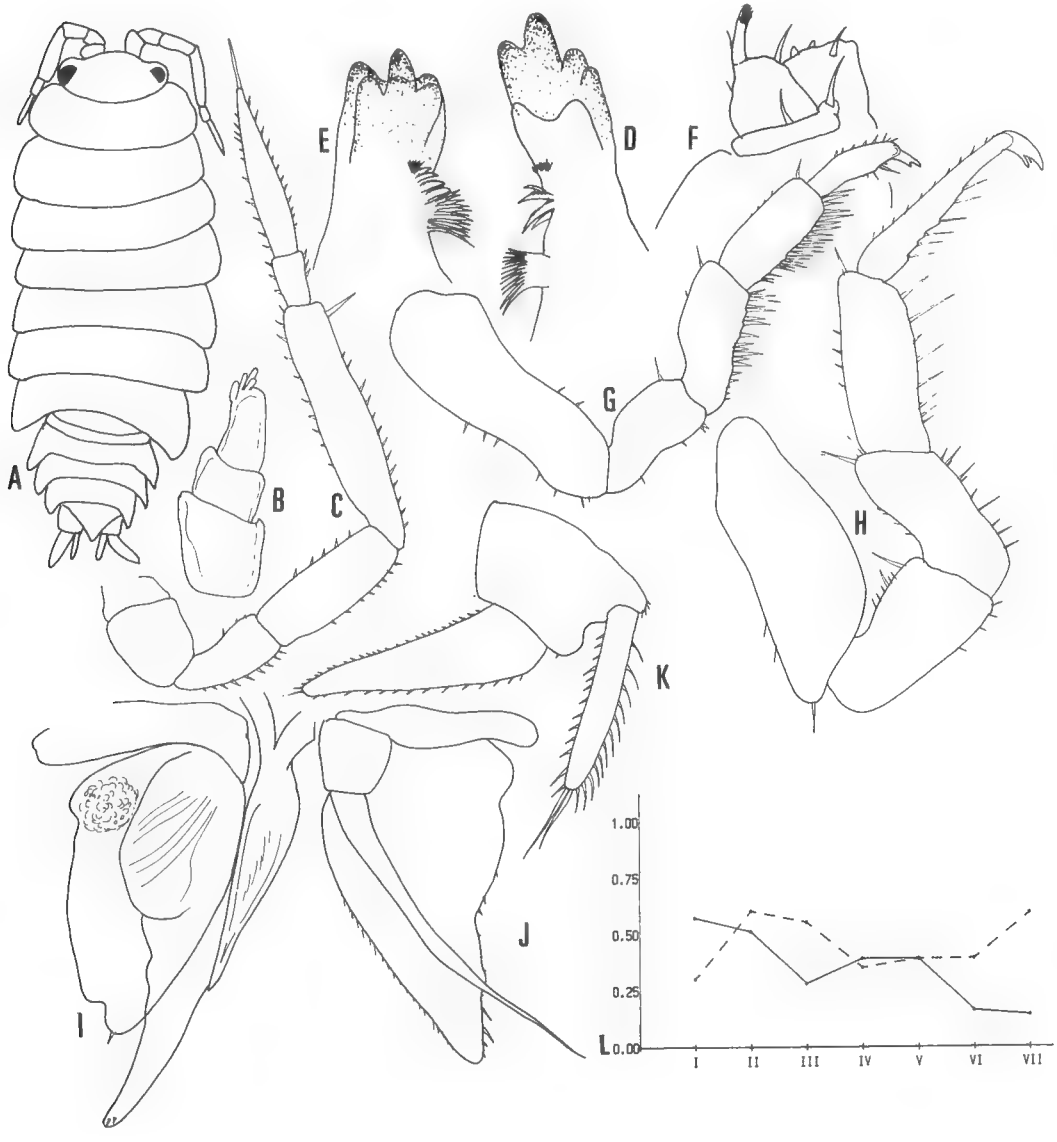

Fig. 124. *Protracheoniscus hokurikuensis* n. sp.

A. Dorsal view; B. First antenna; C. Second antenna; D. Right mandible; E. Left mandible; F. Maxilliped; G. First peraeopod; H. Seventh peraeopod; I. Penes and male first pleopod; J. Male second pleopod; K. Uropod; L. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All: Hoplotype male).

***Protracheoniscus pannuosus* n. sp.**

(Jap. name : Madara-sato-warajimushi, new)

Fig. 125

Material examined : 1♂(holotype, 4.0mm in body length) and 9♀♀ (1♀ allotype, 5.4mm in body length and 8♀♀ paratypes, 5.3～6.1mm in body length), Shibagaki, Hakui City, Ishikawa Pref., coll. Noboru Nunomura, May 26, 1986. Type series is deposited as follows : holotype (TOYA-Cr-6761), allotype (TOYA-Cr-6762) and 5 paratypes (TOYA-Cr-6763～6764) at the Toyama Science Museum, a paratype (OMNH-Ar-3099) at the Osaka Museum of Natural History, a paratype (YCM-CI-944) at the Yokosuka Museum of Natural History, and a paratype (NSMT-Cr-9351) at the National Science Museum, Tokyo.

Description : Body oval-lanceolate, 2.3 times as long as wide. Body colour reddish brown with paler irregular patterns on dorsal surface smooth. Cephalon round ; medial process triangular ; lateral lobes rectangular. Eyes mediocre in size, each eye composed of 10 ocelli. Each peraeonal somite subequal in length. Pleotelson triangular, sides not concave. Noduli lateralis as Fig. 125 M.

First antenna (Fig. 125 B) ; first segment big and square ; second segment short ; terminal segment rectangular with 3 aesthetascs at the tip.

Second antenna (Fig. 125 C), reaches the anterior part of second peraeonal somite. Flagellum slightly shorter than the fifth peduncular segment ; second segment more than 3 times as long as the first.

Right mandible (Fig. 125 D) ; pars incisiva 2～3-headed ; lacinia mobilis weakly 2～3-headed ; 2～3 hairy bristles between lacinia mobilis and processus molaris.

Left mandible ; pars incisiva 3-headed ; lacinia mobilis 4-headed ; 2 hairy bristles between lacinia mobilis and processus molaris.

First maxilla (Fig. 125 E) ; outer lobe with 10 (4+6) entire teeth at the tip.

Second maxilla (Fig. 125 F) bilobed.

Maxilliped (Fig. 125 G) ; endite rectangular with 3 spines and a strong seta ; palp slender.

First peraeopod (Fig. 125 H) ; basis oblong ; ischium and merus rather short ; carpus slightly longer than merus and bears many long setae on inner maregin ; propodus 2 long setae and many denticles on inner margin.

Seventh peraeopod (Fig. 125 I) ; basis rectangular ; ischium with a low sternal margin ; merus rectangular with 7～8 setae on inner margin ; carpus longer than merus and bears with many setae on inner margin ; propodus with 3 longer and 5～6 shorter setae on inner margin.

Penes (Fig. 127 J) club-shaped.

Male first pleopod (Fig. 125 J) ; endopodite straight ; exopodite triangular, outer margin mostly sinuate.

Male second pleopod (Fig. 125 K) ; endopodite perhaps long (in the observed specimen, those of both sides are broken) ; exopodite deltoid.

Uropod (Fig. 125 L) ; basis almost square relatilvely short ; endopodite rather stout ;

exopodite stout slightly longer than the endopodite and with many small denticles around the margin.

Remarks : The present new species is most closely allied to *Protracheoniscus hokurikuensis* but the former is separated from the latter in the following features : (1) shape of exopodite of male first pleopod, (2) all noduli lateralis are near to the lateral margins, (3) less

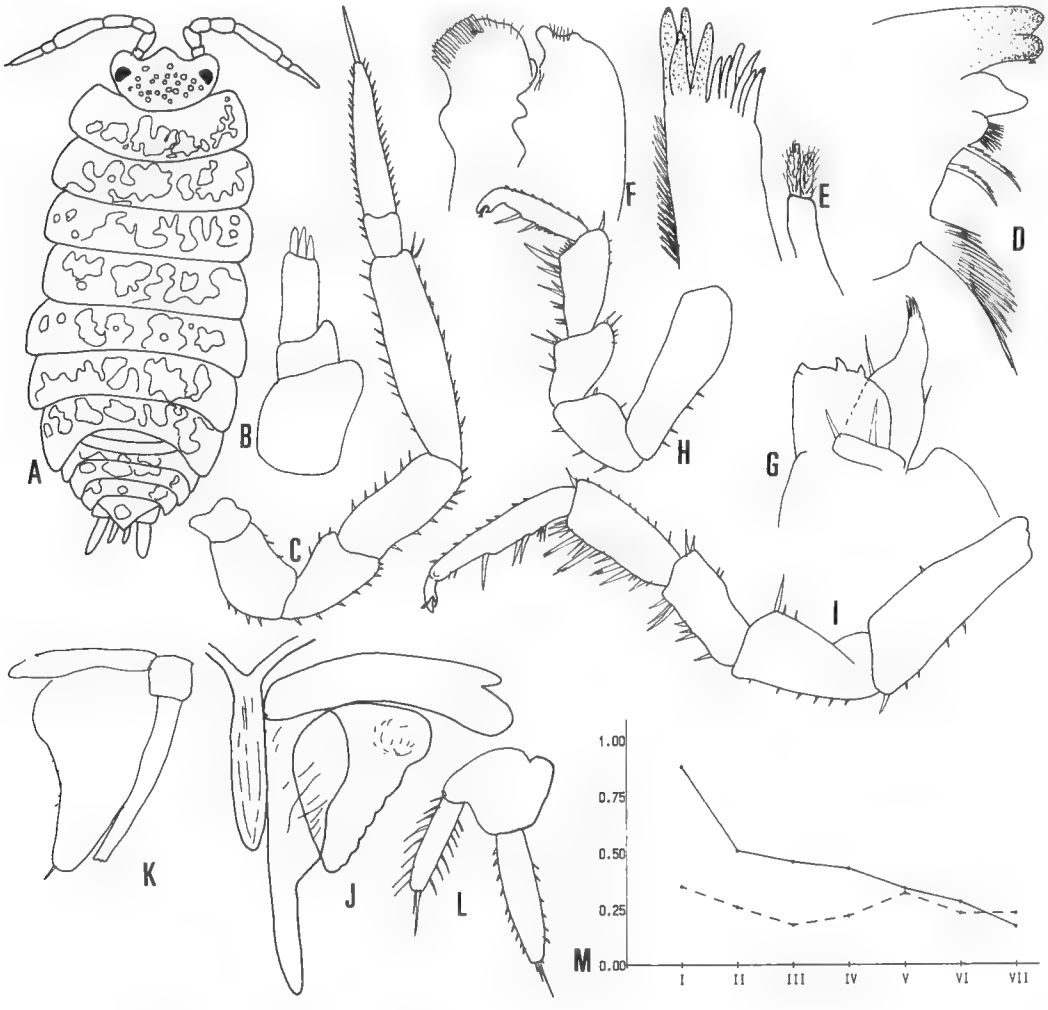

Fig. 125. *Protracheoniscus pannuosus* n. sp.

A. Dorsal view ; B. First antenna ; C. Second antenna ; D. Right mandible ; E. First maxilla ; F. Second maxilla ; G. Maxilliped ; H. First peraeopod ; I. Seventh peraeopod ; J. Penes and male first pleopod ; K. Male second pleopod (endopodite is broken !) ; L. Uropod ; M. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All : Holotype male).

numerous aesthetascs at the tip of first antenna, (4) shorter first peraeopod, and (5) speckled body colour patterns (perhaps there may be some variations in this feature).

***Protracheoniscus circacaudatus* n. sp.**

(Jap. name : Maruo-sato-warajimushi, new)

Fig. 126

Material examined : 3♂♂ (1♂ holotype, 5.1mm in body length and 2♂♂ paratypes, 4.5～4.7mm in body length) and 15♀♀ (1♀ allotype, 5.1mm in body length, 14♀♀ paratypes, 3.2～5.4mm in body length, Sakurababa, Tokuyama City, Yamaguchi Pref., coll. Noboru Nunomura, Sep. 26, 1983. Type series is deposited as follows : holotype (TOYA-Cr-6751), allotype (TOYA-Cr-6752) and 8 paratypes (TOYA-Cr-6753～6760) at the Toyama Science Museum, 2 parataypes (OMNH-Ar-3096～3098) at the Osaka Museum of Natural History, 2 paratypes (YCM-CI-942～943) at the Yokosuka City Museum and 2 paratypes (NSMT-Cr-9350) at the National Science Museum, Tokyo.

Description : Body lanceolate, 2.4 times as long as wide. Body colour brown with many paler irregular patterns. Body surface smooth. Cephalon round with a low medial process and lateral lobes small. Eyes rather big, each eye composed of 14～15 ocelli. Each peraeonal somite subequal in length. Posterolateral margins of all the peraeonal somites round. Pleotelson short with a rounded tip and sides shallowly concave. Noduli lateralis on peraeonal somites IV and VII are remarkably remote from the lateral margin (Fig. 126N).

First antenna (Fig. 126 B) ; first segment rectangular ; second segment short ; terminal segment rectangular with 8 aesthetascs at the tip.

Second antenna (Fig. 126 C), reaching the anterior part of the second peraeonal somite, mutual length of second to fifth peduncular segments is 4 : 5 : 8 : 11 ; fifth peduncular segment with a big seta near the distal end. Flagellum as long as the fifth peduncular segment, second segment about 3 times as long as the first.

Right mandible (Fig. 126 D) ; pars incisiva weakly 2-headed ; lacinia mobilis 2-headed ; 4 hairy bristles between lacinia mobilis and processus molaris.

Left mandible (Fig. 126 E) ; pars incisiva 3-headed ; lacinia mobilis 2-headed ; 2 hairy bristles between lacinia mobilis and processus molaris.

First maxilla (Fig. 126 F) ; outer lobe with 10 (4+6) entire teeth.

Second maxilla (Fig. 126 G) bilobed.

Maxilliped (Fig. 126 H) ; endite round 4 spines and a strong seta ; palp relatively stout.

First peraeopod (Fig. 126 I) ; basis oblong ; ischium rather short ; merus and carpus rectangular with 11～14 setae on inner margin and a seta at outer distal corner ; propodus relatively short with 3 bigger and more than 10 shorter setae on inner margin.

Seventh peraeopod (Fig. 126 J) ; basis oblong with a stout seta inner distal corner ; ischium with a relatively small sternal margin beraing 2～3 setae ; merus rectangular and as long as ischium ; carpus a little longer than merus and with 2～3 long setae and 7～8 smaller

setae on inner margin ; propodus relatively short.

Penes (Fig. 126 K) fusiform.

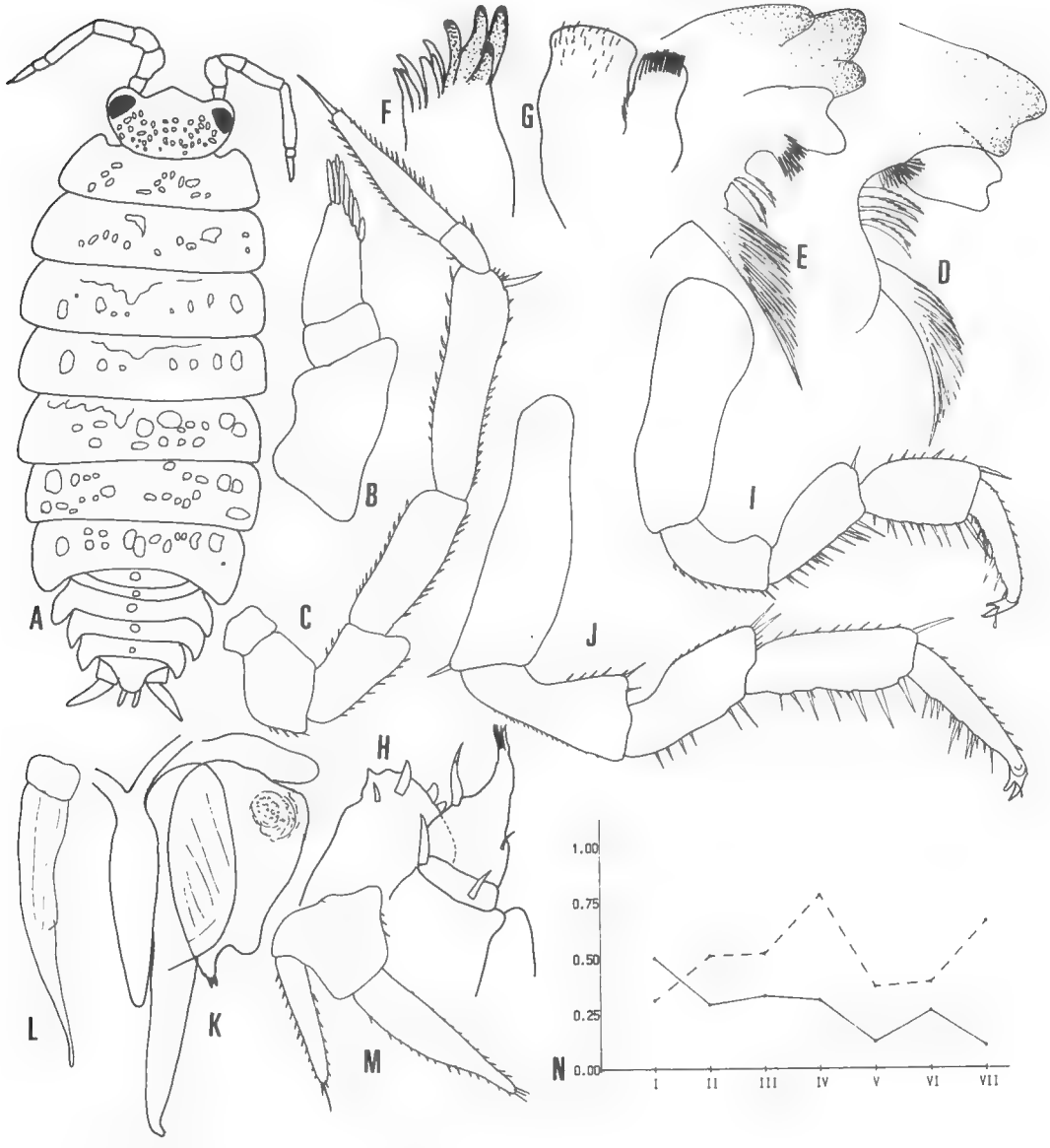

Fig. 126. *Protracheoniscus circacaudatus* n. sp.

A. Dorsal view ; B. First antenna ; C. Second antenna ; D. Right mandible ; E. Left mandible ; F. Outer lobe of first maxilla ; G. Second maxilla ; H. Maxilliped ; I. First peraeopod ; J. Seventh peraeopod ; K. Penes and male first pleopod ; L. Endopodite of male second pleopod ; M. Uropod ; N. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All : Holotype male).

Male first pleopod (Fig. 126 K) ; endopodite straight but the apical part bent outerwards ; exopodite quadrangular with a concavity and 2 denticles on the inner projection, outer margin sinuate.

Male second pleopod (Fig. 126 L) ; endopodite short and straight.

Uropod (Fig. 126 M) ; basis almost square ; endopodite narrow lanceolate ; exopodite relatively slender, 1.3 times as long as endopodite.

Remarks : The present new species is most closely allied to *Protracheoniscus masahitoi* already described in this paper, but the former is separated from the latter in the following fearures : (1) round tip of pleotelson, (2) remote position of noduli lateralis on peraeonal somite IV instead of II to III, (3) more numerous aesthetascs at the tip of first antenna, and (4) shorter endopodite of male second pleopod.

***Protracheoniscus awaensis* n. sp.**

(Jap. name : Awa-sato-warajimushi, new)

Fig. 127

Material examined : 2♂♂ (1♂ holotype, 3.1mm in body length and 1♂ paratype, 4.4mm in body length) and 11♀♀ (1♀ allotype, 4.4mm in body length and 10♀♀ paratypes 2.3～4.4mm in body length, Bizan, Tokushima-City, Tokushima Pref., coll. Hiroshi HARADA. Type series is deposited as follows : holotype (TOYA-Cr-6738), allotype (TOYA-Cr-6739) and 5 paratypes (TOYA-Cr-6740～6744) at the Toyama Science Museum, 2 paratypes (OMNH-Ar-3092～3093) at the Osaka Museum of Natural History, 2 paratypes (YCM-CI-940～941) at the Yokosuka City Museum and 2 paratypes (NSMT-Cr-9348) at the National Science Museum, Tokyo.

Description : Body oval-lanceolate, 2.2 times as long as wide. Body colour dull yellow with 3 rows of brown patterns. Body surface only weakly granulated. Cephalon round ; medial process round ; lateral lobes weakly developed and round. Eyes relatively big, each eye composed of 15～16 ocelli. Each peraeonal somite subequal in length. Each peraeonal somite subequal in length. All the peraeonal somites without any concavity on the posterior margin. Pleotelson triangular but relatively short, sides without concavity. Noduli lateralis on all the peraeonal somites relatively near to the lateral margin (Fig. 127 N).

First antenna (Fig. 127 B) ; first segment square ; second segment short ; terminal segment rectangular with 4 aesthetascs at the tip.

Second antenna (Fig. 127 C), reaches the anterior margin of the second peraeonal somite ; flagellum 85% as long as the fifth peduncular segment, second flagellar segment 3.5 times as long as the first.

Right mandible (Fig. 127 D) ; pars incisiva 2-headed ; lacinia mobilis 2-headed ; 3 hairy bristles between lacinia mobilis and processus molaris.

Left mandible (Fig. 127 E) ; pars incisiva weakly 4-headed ; lacinia mobilis 3-headed ; 4 hairy bristles between lacinia mobilis and processus molaris.

First maxilla (Fig. 127 F) ; outer lobe with 10 (4+6) teeth at the tip, two of them are bifid type.

Second maxilla (Fig. 127 G) bilobed.

Maxilliped (Fig. 127 H) ; endite rectangular with 3 stout spines ; palp small.

First peraeopod (Fig. 127 I) ; basis oblong ; ischium rectangular ; merus and carpus

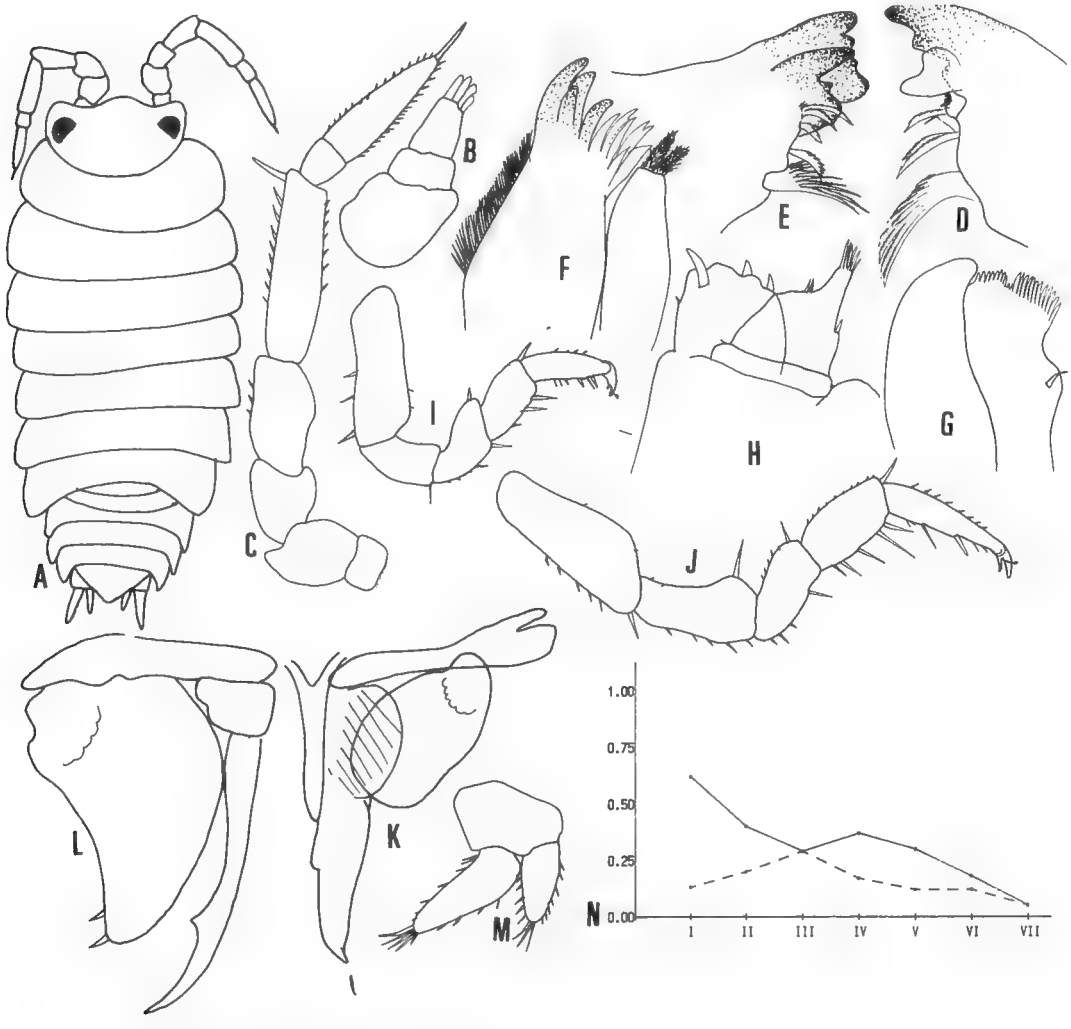

Fig. 127. *Protracheoniscus awaensis* n. sp.

A. Dorsal view ; B. First antenna ; C. Second antenna ; D. Right mandible ; E. Left mandible ; F. First maxilla ; G. Second maxilla ; H. Maxilliped ; I. First peraeopod ; J. Seventh peraeopod ; K. Penes and male first pleopod ; L. Male second pleopod ; M. Uropod ; N. Position of noduli lateralis, a full line shows b/c and a broken line shows d/c (All : Holotype male).

relatively short with 4~5 sparse setae on inner margin ; propodus short.

Seventh peraeopod (Fig. 127 J) ; basis rectangular ; ischium rather long ; merus and carpus rectangular with 4~6 setae on inner margin ; popodus long.

Penes (Fig. 127 K) narrow.

Male first pleopod (Fig. 127 K) ; endopodite relatively short and straight ; exopodite elliptical without any concavity.

Male second pleopod (Fig. 127 L) ; endopodite straight with a protuberence around medial part of outer margin ; exopodite triangular with a very shallow concavity on outer

Fig. 128. Map showing the geographical distribution of the genus *Protrachoeniscus.*

margin.

Uropod (Fig. 127 M)short and robust ; basis short ; endopodite robust with 3 long setae at the tip ; exopodite also robust, 1.5 times as long as endopodite.

Remarks : The present species is separated from *Protracheoniscus masahitoi* already described in this paper in the following features : (1) shorter second antenna, (2) round exopodite of male first pleopod, (3) shorter pleotelson and uropod, (4) less numerous aesthetascs at the tip of first antenna, and (5) position of noduli lateralis.

Family Porcellionidae VERHOEFF, 1918

(Jap. name : Warajimushi-ka)

Exopodites of pleopods 1～2 with pseudotracheae. Flagellum of second antenna 2-segmented. Unable to conglobate. Exopodites of uropod always protruding backwards. The family Porcellionidae contains at least 15 genera, of which *Leptotrichus*, *Porcellio* and *Porcellionides* are distributed in Japan.

Key to the genera of the Family Porcellionidae in Japan

1 Second antenna relatively long, usually at least reaches second peraeonal somite. Uropod long 2

1' Second antenna remarkably short, at least reaches anterior part of first peraeonal somite. Uropod short ..... Genus *Leptotrichus*

2 Lateral lobes of cephalon strongly developed, outline of peraeon and pleon continuous ..... Genus *Porcellio*

2' Lateral lobes of cephalon poorly developed, outline of peraeon and pleon weakly discontinuous ..... Genus *Porcellionides*

Genus *Leptotrichus* BUDDE-LUND, 1885

(Jap. name : Chobihige-warajimushizoku, new)

Body convex, scarecely contractile. Second antenna short, first four peduncular segments subequal in length. Flagellum composed of 2 segments, of which the first segment is much shorter than the second. Uropod short.

Key to the Japanese species of the Genus *Leptotrichus*

1 Body wide, less than twice as long as wide. Exopodite of male first pleopod pentagonal ..... *Leptotrichus fuscatus* (IWAMOTO)

1' Body relatively slender more than twice as long as wide. Exopodite of male first pleopod trapeozoidal ..... *Leptotrichus kudakaensis* n. sp.

Leptotrichus fuscatus (IWAMOTO, 1943)

(Jap. name : Herijiro-warajimushi)

Fig. 129

Porcellio fuscatus IWAMOTO, 1943

Material examined : 1♂ and 1♀, Kôshien, Nishinomiya-City, Hyogo Pref., coll. Hiroyuki Watanabe, Nov. 28, 1978.

Description : Body elliptical, 1.7 times as long as wide. Body colour grayish with 2 series of irregular black patterns. Cephalon ; medial process round ; lateral projections pretty large and rectangular. Eyes mediocre, each eye with 9～10 ocelli. Each peraeonal somite subequal in length ; all the somite with convex posterolateral margins. Posterolateral margins of pleonal somites I-III well developed. Pleotelson triangular with very shallow concavities on both lateral margins.

First antenna ; first segment stout ; second segment short ; terminal segment rectangular with 10～12 aesthetascs at the tip.

Second antenna (Fig. 129 B) short, reaching the posterior half of the first peraeonal

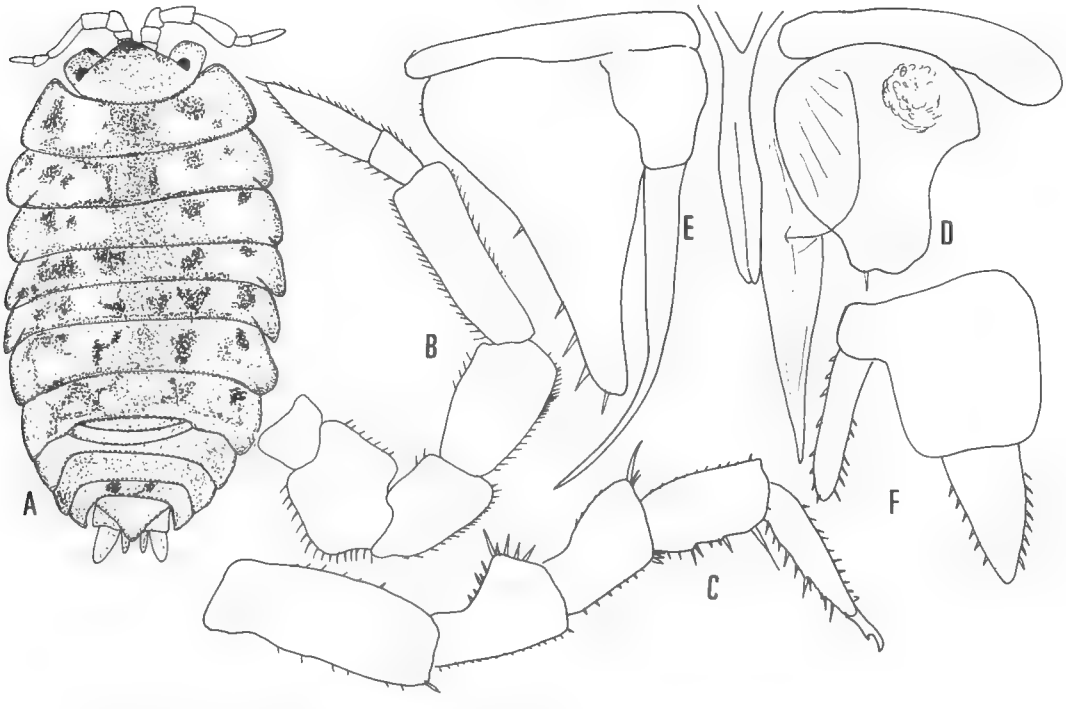

Fig. 129. *Leptotrichus fuscatus* (IWAMOTO, 1943)

A. Dorsal view ; B. Second antenna ; C. Seventh peraeopod ; D. Penes and male first pleopod ; E. Male second pleopod ; F. Uropod (All : Specimens collected from Kobe City, Hyogo Pref.).

somite, second and third peduncular segments almost square ; fourth segment a little longer than the third ; fifth segment 1.4 times as long as the fourth ; flagellum a little shorter than the fifth peduncular segment ; second segment 2.7 times as long as the first.

Right mandible ; pars incisiva 2-headed ; lacinia mobilis 2-headed ; 4 hairy bristles between lacinia mobilis and processus molaris.

Left mandible ; pars incisiva 3-headed ; lacinia mobilis 2-headed ; 3 hairy bristles between lacinia mobilis and processus molaris.

First maxilla ; outer lobe with 10 (4+6) teeth at the tip.

Second maxilla ; bilobed and pretty wide.

Maxilliped ; endite rectangular with 2 spines and a seta ; palp relatively stout.

Seventh peraeopod (Fig. 129 C) ; basis rectangular ; ischium short with a sternal margin with 4～5 setae ; merus short and width increases towards the tip ; carpus short and rectangular ; propodus not so short.

Penes (Fig. 129 D) fusiform, rather narrow.

Male first pleopod (Fig. 129 D) ; endopodite rather short and stout ; exopodite almost round with a shallow concavity on outer margin and 2 small spines at the tip.

Male second pleopod (Fig. 129 E) ; endopodite long ; exopodite elongated traingular with 4 spines on inner margin.

Uropod (Fig. 129 F) ; basis almost square ; endopodite narrow ; exopodte stout but short, slightly shorter than endopodite.

Remarks : This species was first recorded from a farm near the seashore of Yokohama City by IWAMOTO (1943). The specimes collected from Nishinomiya City agrees well with the original description.

Leptotrichus kudakaensis n. sp.

(Jap. name : Montsuki-warajimushi, new)

Fig. 130

Material examined : 3♂♂ (1♂ holotype, 5.8mm in body length and 2♂♂ paratypes, 4.5～5.7mm in body length and 12♀♀ (1♀ allotype, 4.7mm in body length and 11♀♀ paratypes 3.6～5.3mm in body length), Kudaka-jima, Chinen-son, Okinawa Island, coll. Hiroshi Hoshikawa, Mar. 20, 1981. Type series is deposited as follows : Holotype (TOYA-Cr-6554), allotype (TOYA-Cr-6555) and 7 paratypes (TOYA-Cr-6556～6562) at the Toyama Science Museum, 2 paratype (OMNH-Ar-3075～3076) at the Osaka Museum of Natural History, 2 paratypes (YCM-CI-928-929) at the Yokosuka City Museum and 2 paratypes (NSMT-Cr-9347) at the National Science Museum, Tokyo.

Description : Body lanceolate, 2.1 times as long as wide. Body colour dull yellow with a row of darker spots. Body surface rough with many stout setae-like structures. Cephalon with a round medial process and a pair of rectangular lateral angles. Eyes mediocre in size, each eye composed of 20 ocelli. Each peraeonal somite subequal in length. All the per-

aeonal somites with rectangular posterolateral angles. Pleotelson deltoid.

First antenna (Fig. 130 B); first segment rectangular; second segment short; third segment rectangular 3~4 aesthetscs at the tip.

Second antenna (Fig. 130 C) remarkably short and only reaches the anterior part of first peraeonal somite; second to fourth peduncular segments subequal in length; fifth segment about twice as long as the fourth. Flagellum, about 80% as long as the fifth peduncular segment, second flagellar segment 3 times as long as the first flagellar segment.

Right mandible (Fig. 130 D); pars incisiva 3-headed; lacinia mobilis 2-headed; 3 hairy bristles between lacinia mobilis and processus molaris.

Left mandible (Fig. 130 E); pars incisiva 4-headed; lacinia mobilis 2-headed; 4 hairy bristles between lacinia mobilis and processus molaris.

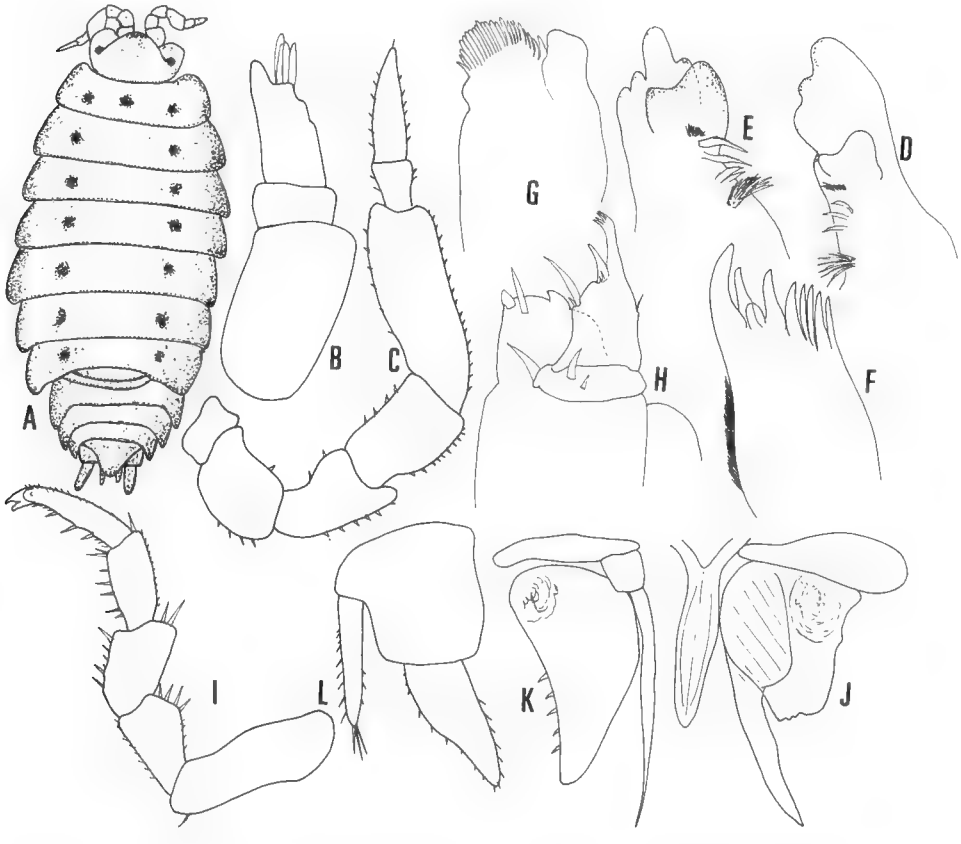

Fig. 130. *Leptotrichus kudakaensis* n. sp.

A. Dorsal view; B. First antenna; C. Second antenna; D. Right mandible; E. Left mandible; F. Outer lobe of first maxilla; G. Second maxilla; H. Maxilliped; I. Seventh peraeopod; J. Penes and male first pleopod; K. Male second pleopod; L. Uropod (All: Holotype male).

First maxilla (Fig. 130 F); outer lobe 10 (4+6) entire teeth at the tip.

Second maxilla (Fig. 130 G) bilobed; dental part occupies all the distal margin of the wider half.

Maxilliped (Fig. 130 H); endite round with 2～3 spines and a strong tooth; palp relatively slender.

Seventh peraeopod (Fig. 130 I); basis rectangular; ischium with a sternal margin with 3～4 setae; merus rectangular but short; carpus relatively short with 10 setae on inner margin; propodus with 4 bigger setae on inner margin.

Penes (Fig. 130 J) lanceolate.

Male first pleopod (Fig. 130 J); endopodite rather narrow, basal part and; exopodite trapeozoidal, with a sinuate distal margin.

Male second pleopod (Fig. 130 K); endopodite fairly long; exopodite elongated triangular with about 5 denticles on outer margin.

Uropod (Fig. 130 L) short; basis square; endopodite narrow; exopodite stout but short, a little shorter than endopodite.

Remarks: The present new species is allied to *Leptotrichus fuscatus* but the former is separated from the latter in the following features: (1) narrower body shape, (2) shape of male first pleopod, (3) round and broader penes, and (4) presence of a pair of distinct black patterns on dorsal surface of peraeon.

Genus *Porcellio* LATREILLE, 1804

(Jap. name: Warajimushi-zoku)

Two pairs of pseudotracheae. Unable to conglobate. First peraeonal tergite with caudally concave epimera. This genus comprises more than 150 described species. But only 3 species have hitherto been collected in Japan. Probably, all of them of the genus might have been introduced from Europe or Northern Africa.

Key to the species of the Genus *Porcellio* found in Japan

1 Body smooth, not tuberculate; uropod long; exopodite of male first pleopod narrow ..... *P. laevis* LATREILLE

1′ Body surface rough, covered with many tubercules; uropod short; exopodite of male first pleopod rather stout 2

2 Pleotelson appears elongated, with a round tip; exopodite of male first pleopod without deep incision ..... *P. dilatatus* BRANDT

2′ Pleotelson short with relatively pointed tip. Exopodite of male first pleopod with a deep incision ..... *P. scaber* LATREILLE

Porcellio scaber LATREILLE, 1804

(Jap. name : Warajimushi)

Fig. 131

Porcellio scaber LATREILLE, 1804 ; ———— LEACH, 1810 ; ———— WHITE, 1850 ; ———— BUDDE-LUND, 1885 ; ———— DOLLFUS, 1896 ; ———— CHILTON, 1901 ; ———— ARCANGELI, 1925 ; ———— JOHANNSEN, 1926 ; ———— VAN NAME, 1936 ; ———— IWAMOTO, 1943 ; ———— SHIINO, 1943 ; ———— VANDEL, 1966

Porcellio toyamaensis NUNOMURA, 1980.

For further synonymy, see VANDEL, 1966.

Material examined : more than 500 samples from the various parts of Northeastern Japan.

Description ; Body oval-lanceolate, 1.7 times as long as wide. Body colour black in many specimens but with paler lateral margins in some specimens and with irregular spotted colour patterns in others. Body surface strongly tuberculated. Eyes relatively big, each eye com-

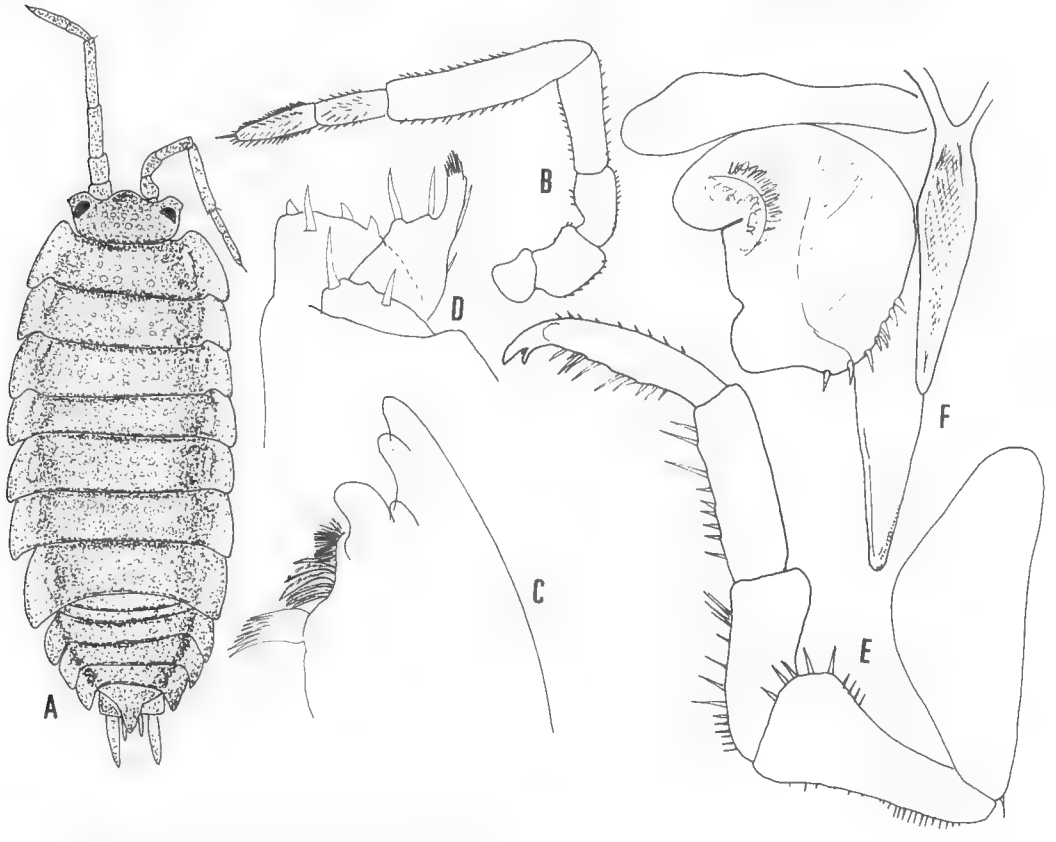

Fig. 131. *Porcellio scaber* LATREILLE, 1804

A. Dorsal view ; B. Second antenna ; C. Right mandible ; D. Maxilliped ; E. Seventh peraeopod ; F. Penes and male first pleopod (All : Male specimen collected at Wakkanai, Hokkaido).

posed of 24 ocelli. Pleotelson deltoid with a slight concavity on both sides.

First antenna ; first segment rectangular; second segment rather short ; terminal segment 8 aesthetascs at the tip.

Second antenna (Fig. 131 B), anterior part of the second peraenal somite, mutual length of second to fifth peduncular segments is 2 : 2 : 3 : 6. Flagellum is 80% length of the fifth peduncular segment, two flagellar segments are almost equal in length.

Right mandible (Fig. 131 C) ; pars incisiva weakly 2～3-headed ; lacinia mobilis 3～4-headed ; 6 hairy bristles between lacinia mobilis and processus molaris.

Left mandible pars incisiva 3-headed ; lacinia mobilis 2-headed ; 4 hairy bristles between lacinia mobilis and processus molaris.

First maxilla ; outer lobe with 10 (4+6) teeth at the tip.

Second mandible bilobed.

Maxilliped (Fig. 131 D) ; endite rectangular with 3 spines and a strong seta ; palp rather slender.

Seventh peraeoepod (Fig. 131 E) ; basis oblong ; ischium with a sternal margin bearing 6～7 setae ; merus and carpus subequal in length, each with 11～14 setae on inner margin ; propodus almost as long as carpus.

Penes (Fig. 131 F) elongated rhomb-shaped and black in colour in many specimens.

Male first pleopod (Fig. 131 F) ; endopodite straight but distal half only slightly bent outwards ; exopodite almost hemicircular, with a incision on outer margin, bearing 8 (specimens from Wakkanai, Hokkaido)～18 (specimens from Toyama) spines on inner margin.

Male second pleopod ; endopodite straight slightly extending beyond exopodite ; exopodite triangular with about 8 small spines on outer margin.

Uropod ; basis rectangular, nearly 1.5 times as long as wide ; endopodite narrow ; exopodite stout.

Remarks : This cosmopolitan species is very common from Hokkaido to Hokuriku Districts, especially in urban areas. The species shows remarkable colour variation, black to grayish brown. *Porcellio toyamaensis* NUNOMURA is really one of the colour variation-type of this species.

Porcellio laevis LATREILLE, 1804

(Jap. name : Kuma-warajimushi, new)

Fig. 132

Porcellio laevis LATREILLE, 1804 ; ———— EICHIWALD, 1841 ; ———— BUDDE-LUND,1885 ; ———— DOLLFUS, 1825 ; ———— CHILTON, 1905 ; ———— VERHOEFF, 1907 ; ———— ARCANGELI, 1924 ; ———— ARCANGELI, 1924 ; ———— VAN NAME, 1936 ; ———— VANDEL 1954 ; ———— VANDEL, 1966

For further synonymy, see VANDEL 1966.

Material examined : 3♂♂ 3♀♀, Kôshien, Nishinomiya City, Hyogo Pref., coll. Hiroyuki

Watanabe ; 2♂♂ 1♀, Higashitarumi, Tarumi-ku, Kobe City, Hyogo Pref., coll. Yasuhiko Shibata, May 12, 1958 ; 10♂♂ 6♀♀, Tsuto-ayaha-chô, Nishinomiya City, Hyogo Pref., coll. Kô Seto June 7, 1976 ; 3♂♂ 3♀♀, Naha City, Okinawa Island, Hiroshi Hoshikawa, Feb, 23, 1981. 1♂ 3♀♀, Izumisano City, Osaka Pref., coll. Noboru Nunomura, Oct. 10, 1975 ; 3♂♂ 1♀, Hamadera, Sakai City, Osaka Pref., July 12～20, 1982 ; 1♀, Miura-kaigan, Miura City, Kanagawa Pref., coll. Noboru Nunomura, Apr. 2, 1986 ; 3♂♂, Nonoe-chô, Suzu City, Ishikawa Pref. and more than 60 specimens from various parts of mainly southern Japan.

Description : Body oval, 2.0 times as long as wide, dorsal surface moderately convex and only weakly granulated. Eyes rather big, each eye with about 36 ocelli. Body colour blackish gray with irregular longitudinal paler patterns. Body surface rather smooth. Cephalon with the lateral lobes well developed, rounded frontal lobe obtusely triangular. Each peraeonal somite subequal in length. Epimeral plates of pleonal somites III-V moderate in size and slightly recurved. Pleotelson subtriangular ; outer part acutely produced and slightly grooved.

First antenna ; first segment big and square ; second segment square ; terminal segment with 8～12 aesthetascs at the tip.

Second antenna (Fig. 132 B), reaching the third peraeonal somite ; first segment small and triangular ; second and third segmemts rectnagular ; fourth segment twice as long as the third ; fifth segment 3 times as long as the third. Flagellum 85% as long as the fifth peduncular segment ; basal segment 1.5 times as long as the terminal one.

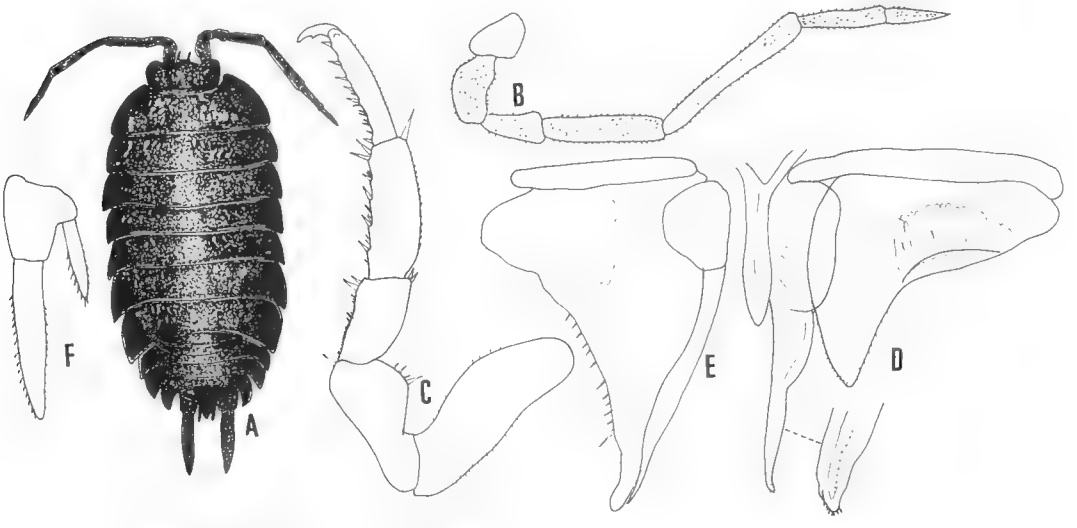

Fig. 132. *Porcellio laevis* LATREILLE, 1804

A. Dorsal view ; B. second antenna ; C. Seventh peraeopod ; D. Penes and male first pleopod ; E. Male second pleopod ; F. Uropod. (All. : Male specimens from Kô-shien, Nishinomiya City , Hyogo Pref.).

Right mandible ; pars incisiva 3-headed ; lacinia mobilis 2-headed ; 6 hairy bristles between lacinia mobilis and processus molaris.

Left mandible ; pars ncisiva 3-headed ; lacinia mobilis 2-headed ; 4 hairy bristles between lacinia mobilis and processus molaris.

First maxilla ; outer lobe with teeth at the tip.

Second maxilla bilobed.

Maxilliped ; endite rectangular with 3 spines ; palp rather slender.

Seventh peraeopod (Fig. 132 C) ; basis oblong ; ischium with a sternal margin bearing 4 ~10 spines ; carpus rectangular with 6 bigger setae and many small setae oninner margin ; carpus almost twice as long as merus, with 8 stout spines and many fine setae ; propodus 80% as long as carpus and with 6 big setae on inner margin.

Penes (Fig. 132 D) fusiform.

Male first pleopod (Fig. 132 D) ; endopodite straight and only slightly bent at the tip ; exopodite triangular with a widely concave outer margin.

Male second pleopod ; endopodite long with a small protuberences ; exopodite triangular with 12~18 small spines on outer margin.

Uropod (Fig. 132 F) ; basis rectangular ; endopodite linear and narrow ; exopodite long, about twice as long as endopodite.

Remarks : This species is now widely distributed in urban areas of southern Japan, but until recent times the occurrence has not been recognized by any scientist. Perhaps the species has been immigrated into Japan in recent years.

Porcelio dilatatus BRANDT, 1833

(Jap. name : Obi-warajimushi)

Fig. 133

Porcellio dilatatus BRANDT, 1833 ; ———— BRANDT & RATENBURG, 1833 ; ———— BUDDE-LUND, 1885 ; ———— VERHOEFF, 1907 ; ———— SARS, 1898 ; ———— VAN NAME, 1940 ; ———— VANDEL, 1946 ; ———— VANDEL, 1962 ; ———— GRUNER, 1966.

Material examined : 2♂♂ 3♀♀, from the campus of Keiô University, Hiyoshi, Kôhoku-ku, Yokahama City, Kanagawa Pref., coll. Yasutoshi Katakura, June 14, 1984 ; 1♀, Daimon-machi, Toyama Pref., coll. Hideharu Hônoki. Apr. 1, 1979 ; 1♂ 1♀, Kô, Tateyama City, Chiba Pref., coll. Noboru Nunomura, June 11, 1987.

Description : Body oval, 1.7 times as long as wide. Body colour black with narrow or small paler patterns. Body surface granulated. Cephalon with triangular medial process lateral lobes fan-shaped, round in inner side and straight in outer side. Eyes mediocre in size, each eye composed of about 20 ocelli. Each peraeonal somite subequal in length. Each pleonal somite subequal in length and neoplerurons well developed. Pleotelson elongated distal part whose tip is round. Noduli lateralis on the first 4 peraeonal somites are remote from the lateral margin.

First antenna ; first segment square ; second segment rather short ; terminal segment rectangular with 8 aesthetascs at the tip.

Second antenna (Fig. 133 B), rather short reaching the posterior end of the first peraeonal somite, first segment triangular ; second segment rectangular with many small spines on inner margin ; third segment almost as long as the second and with a series of setae on inner margin fourth early twice as long as the third ; fifth segment again about twice as long as the fourth. Flagellum 2-segmented and about two-thirds as long as the fifth peduncular segment ; each segment is subequal in length.

Right mandible ; pars incisiva 3-headed ; lacinia mobilis 2-headed ; 6 hairy bristles between lacinia mobilis and processus molaris.

Left mandible ; pars incisiva 4-headed ; lacinia mobilis single-toothed ; 6 hairy bristles between lacinia mobilis and processus molaris.

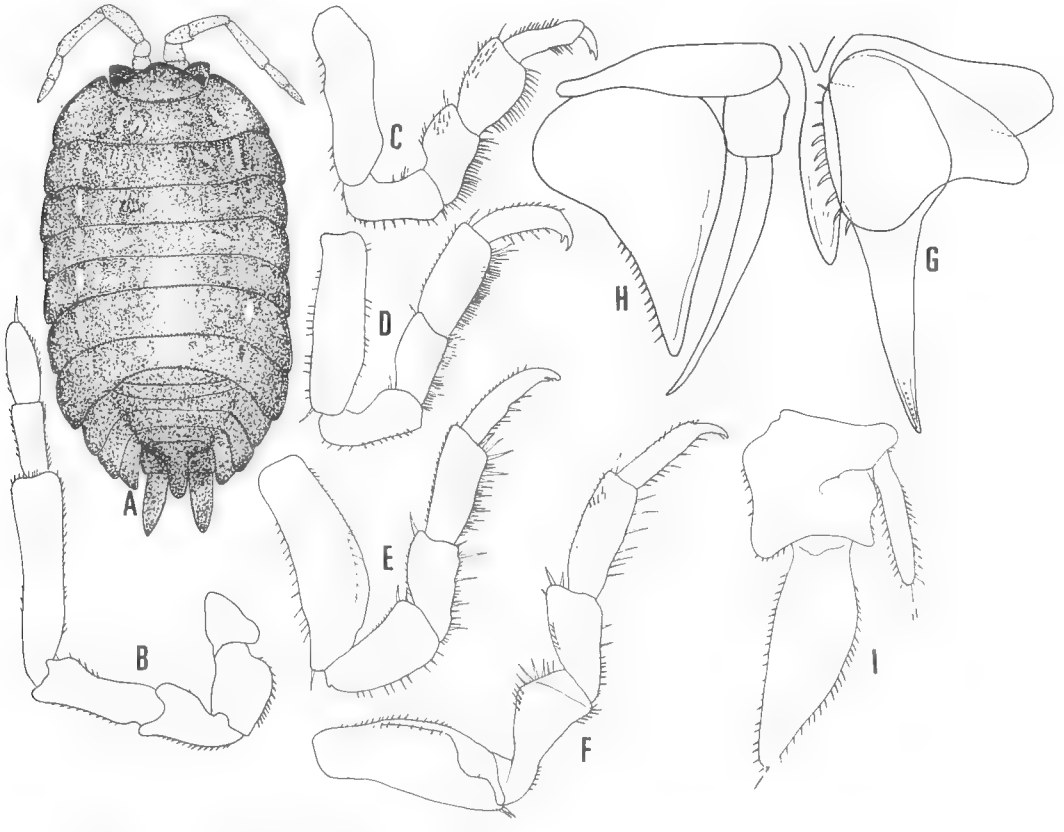

Fig. 133. *Porcellio dilatatlus* BRANDT, 1833

A. Dorsal view ; B. Second antenna ; C. First peraeopod ; D. Third peraeopod ; E. Fifth peraeopod ; F. Seventh peraeopod ; G. Penes and male first pleopod ; H. Male second pleopod ; I. Uropod (All : Male specimens collected at Yokohama City).

First maxilla ; outer lobe with 10 (4+6) teeth at the tip.

Second maxilla bilobed.

Maxilliped ; endite rectangular with 4 spines and 2 strong teeth ; palp rather slender.

First peraeopod (Fig. 133 C) ; basis long ; ischium rectangular ; merus and carpus stout with many setae on inner margins and short setae on outer part ; propodus relatively short.

Seventh peraeopod (Fig. 133 F) basis rectangular ; ischium with a sternal margin ; merus long triangular ; carpus rectangular, 1.3 times as long as merus ; propodus relatively short.

Fig. 134. Map showing the geographical distribution of the genera *Leptotrichus* and *Porcellio*.

Penes (Fig. 133 G) fusiform.

Male first pleopod (Fig. 133 G); endopodite straight; exopodite semicircular, outer margin with a shallow concavity; inner margin with 12 strong spines.

Male second pleopod (Fig. 133 H); endopodite rather short, slightly extended beyond exopodite; exopodite triangular with 13 spines on outer margin.

Uropod (Fig. 133 I); basis square; endopodite narrow; exopodite stout and rather long, alomost twice as long as endopodite.

Remarks: This species is said to be cosmopolitan, but so far I could ascertain only 3 colonies in Japan. And these specimens agree best with the description of *Porcellio dilatatus dilalatus*.

Genus *Porcellionides* MIERS, 1877

(Jap. name: Hoso-warajimushi-zoku)

Exopodite of pleopods 1-2 with *Porcellio*-like pseudotracheae. Second antenna with 2-segmented flagellum. Cephalon without distinct lateral and medial lobes; frontal line well-developed; peraeonal somites 1-3 with caudally rounded epimera, not concave. Pleotelson triangular. Only one species *Porcellionides pruinosus* is distributed in Japan.

Porcellionides pruinosus (BRANDT, 1833)

(Jap. name: Hoso-warajimushi)

Fig. 135

Porcellio pruinosus BRANDT, 1833

Porcellionides pruinosus SARS, 1898; ———— VERHOEFF, 1918; ———— VAN NAME, 1936.

Methoponorthus pruinosus HILGENDORF, 1893a; ———— HILGENDORF, 1893b; ———— DOLLFUS, 1897; ———— SHIINO, 1965 and many authors.

For further synonymy, see VANDEL, 1966.

Material examined: 3♂♂ 5♀♀, Tenjin, Himeji City, Hyogo Pref., coll. Noboru Nunomura, May 13, 1975; 4♂♂ 1♀, Nagai Park, Higashisumiyoshi-ku, Osaka City, Osaka Pref., coll. Noboru Nunomura, May 17, 1975, and more than 400 specimens from the various parts of southern Japan (From Sado Island, Niigata Pref. to Yaeyama Islands, Okinawa Pref.).

Description: Body oblong, 2.2 times as long as wide. Eyes mediocre in size, each eye with 20 ocelli. Body colour reddish purple in alcohol but brillantly reddish purple in alival state. Cephalon transeversely quadrangular with minute lateral lobes, medial process low. All the peraeonal soimite subequal in length. Pleotelson tiangular, sides somewhat concave.

First antenna (Fig. 135 B) small, first and second segments square, terminal segment rectangular

Second antenna (Fig. 135 C), reaches the posterior margin of the second peraeonal somite. Flagellum slightly shorter than the fifth peduncular segment first flagellum 1.6 times as long

as the second.

Right mandible ; pars incisiva 3-headed ; lacinia mobilis 2-headed ; 4 hairy bristles between lacinia mobilis and processus molaris.

Left mandible ; pars incisiva 3-headed ; lacinia mobilis 3-headed ; 6 hairy bristles between lacinia mobilis and processus molaris.

First maxilla (Fig. 135 D) ; outer lobe with 10 (4+6) teeth at the tip, 4 of which are bifid.

Second maxilla bilobed.

Maxilliped (Fig. 135 E) ; endite rectangular with 3 spines palp slender.

First peraeopod (Fig. 135 F) ; basis oblong ; ischium elongated triangular ; merus and carpus rectangular with many setae on inner margin ; propodus relatively short.

Seventh peraeopod (Fig. 135 G) ; basis oblong ; ischium with a sternal margin ; merus

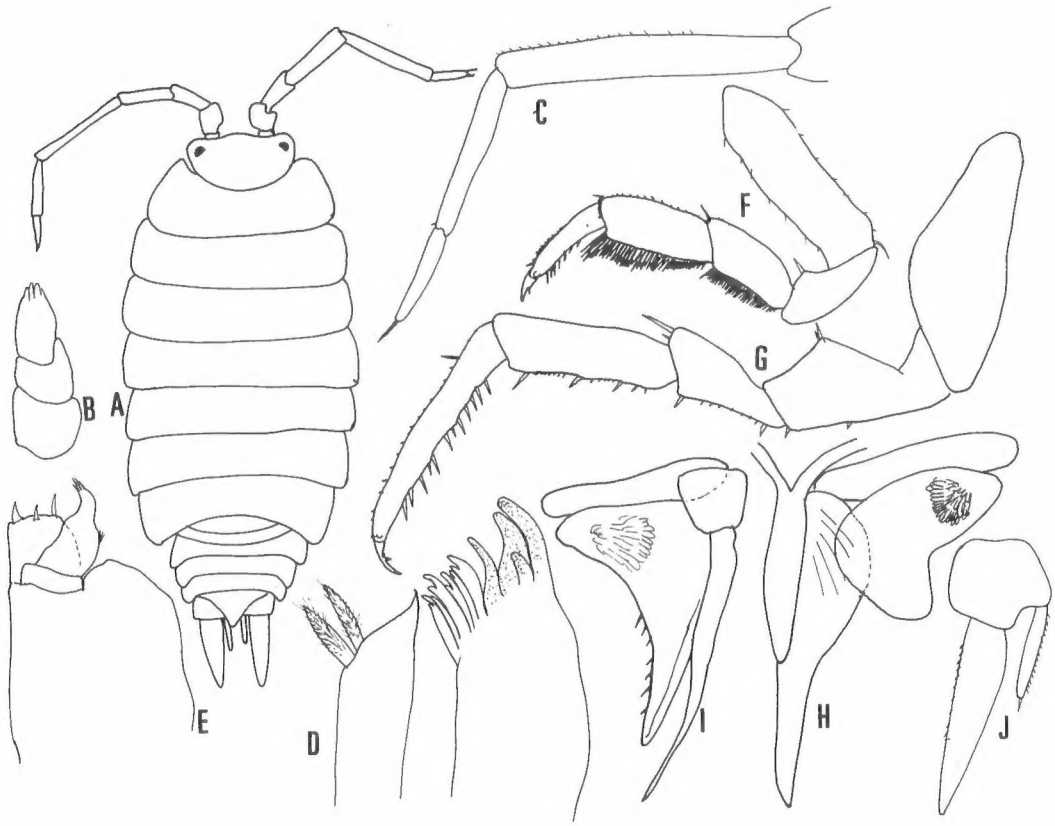

Fig. 135. *Porcellionides pruinosus* (BRANDT, 1833)

A. Dorsal view ; B. First antenna ; C. Flagellum of second antenna ; D. First maxilla ; E. Maxilliped ; F. First peraeopod ; G. Seventh peraeopod ; H. Penes and male first pleopod ; I. Male second pleopod ; J. Uropod (All : Male specimens collected at Himeji, Hyogo Pref.,).

triangular ; carpus rectangular ; propodus pretty long with about 12 setae on inner margin.

Penes (Fig. 135 H) fusiform.

Male first pleopod (Fig. 135 H) ; endopodite straight and relatively short ; exopodite triangular with a wide concavity on outer margin. Several minute spines are on the inner margin.

Male second pleopod (Fig. 135 I) ; endopodite long ; exopodite triangular, outer margin concave.

Uropod (Fig. 135 J) ; basis almost square ; endopodite narrow; exopodite stout and long,

Fig. 136. Map showing the distribution of the *Porcellionides pruinosus*.

2.3 times as long as wide.

Remarks : This species is very common from the central to southern Japan, especially under stones, under the discarded veneer plates and near compost piles in the farm or urban area.